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UNITED STATES DEPARTMENT OF AGRICULTURE
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PROPOSED REVISED FEDERAL GRAIN STANDARDS

Including Explanations

Prepared in the
BUREAU OF AGRICULTURAL ECONOMICS

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FOREWORD

This report has been prepared for the primary purpose of summarizing and presenting for public consideration the studies made by the Bureau of Agricultural Economics in recent years with reference to the possibilities for improving the standards for wheat, rye, corn, oats, feed oats, mixed feed oats, barley, and grain sorghums that have been promulgated at various times since 1916 under the provisions of the Grain Standards Act, and with reference to the desirability of establishing new standards for mixed grain. These studies have been suggested by the experience gained by the Bureau and the grain industry in the use and application of the present official standards. Furthermore, changes in merchandising, milling, or other processing, and baking practices have occurred since the

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standards were promulgated, which have indicated the need for, and desirability of, effecting certain revisions and improvements.

This report is presented in two parts. The first part comprises a complete set of proposed, revised, grain standards, accompanied by proposed regulations for the certification of important information about grain quality that would supplement grade designations and that would be noted on certificates under Remarks. The second part consists of explanatory matter which deals largely with those proposed additions to and revisions of the present grain standards that are of major importance, and which discusses the objectives sought.

In the conduct of these grain-standardization studies, the Bureau has sought information from many sources on grain standardization and marketing problems that was applicable to the many proposed revisions that have been under consideration. Exhaustive studies of Federal supervision and grain-inspection department data were made to ascertain how the grain crops graded under the present official standards, and much constructive information, based on observation and experience, was obtained by informal conferences and correspondence with representatives of the grain trade, the millers, the producer organizations, the grain inspection departments, the State departments of agriculture, and the State agricultural colleges. Also for a period of 2 years an experimental application of the proposed, revised standards, was made in the field offices of Federal grain supervision for the purposes of checking the inspection practicability of the proposed standards and of observing their effect on the grading of the market receipts of grain.

Although the Bureau believes that these proposed grain standards, as a whole, correlate more closely with modern conditions of grain production, modern trade practices, and the modern requirements of grain users, than do the present official grain standards, it realizes that grain marketing, warehousing, processing, and inspection, are complex and intricate subjects; that many diverse opinions are prevalent in the grain industry with reference to the grain standards, and that any hastily effected changes in these standards might affect adversely the interests of numerous individuals. Furthermore, the possibility exists that, due to insufficient information and checking, some of the specific features of the proposed standards may need detailed correction in the interests of practicability and usefulness.

For these reasons the Bureau believes it desirable, for the benefit of the grain industry, to subject these proposed grain standards to a period of public consideration, wherein full opportunity may be had by the producers, dealers, handlers, processors, exporters, and inspectors, of grain to examine carefully the proposed revisions and additions, and to consult with the Bureau thereafter as to any proposed specification that may be held to be in error. The Bureau believes further that if a cooperative study and checking of these proposed standards are effected, the interests of the entire grain industry would be well met and that revised grain standards that would meet the requirements of the industry as fully as possible within the scope of the Grain Standards Act may be promulgated eventually.

To this end the Bureau is hopeful that the producer organizations, the grain trade, the grain processors, the grain inspectors, and the

State departments of agriculture and agricultural colleges, will arrange to give thorough and constructive consideration to the proposed standards and to the accompanying explanatory report. Insofar as time and personnel permit, the Bureau will welcome opportunities to consult with organized representatives of the grain industry with reference to these grain standardization problems during this proposed period of public consideration.

NILS A. OLSEN,
Chief, Bureau of Agricultural Economics.

WASHINGTON, D.C., *June 1933.*

PROPOSED REVISED STANDARDS FOR GRAIN

(Not official standards)

PROPOSED WHEAT STANDARDS [1]

(Not official standards)

For the purpose of the proposed grain standards of the United States for wheat.

Wheat.—Wheat shall be any grain which, before the removal of dockage, consists of 50 percent or more of wheat and not more than 10 percent of other grains for which standards have been established under the provisions of the Grain Standards Act. The term wheat in these standards shall not include emmer, spelt, einkorn, Polish, and poulard wheat.

Classes.—Wheat shall be divided into seven classes as follows: Class I, Hard Red Spring; Class II, Durum; Class III, Red Durum; Class IV, Hard Red Winter; Class V, Soft Red Winter; Class VI, White; and Class VII, Mixed Wheat.

Grades.—Wheat shall be graded and designated according to the respective grade requirements of the numerical grades and sample grade of the class and subclass to which it belongs, and according to the special grades when applicable.

HARD RED SPRING WHEAT (CLASS I)

This class shall include all varieties of hard red spring wheat, and may include not more than 10 percent of wheats of other classes. This class shall be divided into three subclasses, as follows:

SUBCLASS (A) DARK NORTHERN SPRING

This subclass shall include wheat of the class Hard Red Spring, consisting of 75 percent or more of dark, hard, and vitreous kernels.

SUBCLASS (B) NORTHERN SPRING

This subclass shall include wheat of the class Hard Red Spring, consisting of less than 75 percent and more than 25 percent of dark, hard, and vitreous kernels.

SUBCLASS (C) RED SPRING

This subclass shall include wheat of the class Hard Red Spring consisting of not more than 25 percent of dark, hard, and vitreous kernels.

[1] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

PLAN A

(60-pound test weight per bushel for grade No. 1)

Class I, Hard Red Spring Wheat

Grade requirements for—(*a*) Dark Northern Spring, (*b*) Northern Spring, (*c*) Red Spring

Grade No.	Minimum test weight per bushel	Maximum limits of—					
		Damaged kernels (wheat and other grains)		Foreign material		Wheats of other classes	
		Total	Heat damaged	Total	Matter except other grains	Total	Durum and/or Red Durum
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	60	2	0.1	1	0.5	5	2
2	58	4	.2	2	1.0	10	3
3	56	7	.5	3	2.0	10	5
4	54	10	1.0	5	3.0	10	10
5	51	15	3.0	7	5.0	10	10
Sample grade	Sample grade wheat shall be wheat of the subclass Dark Northern Spring, or Northern Spring, or Red Spring, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 16 percent moisture, or more than 10 percent cracked kernels; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.						

NOTE.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, Ergoty, and Treated wheat, and for Unnatural Material.

PLAN B

(58-pound test weight per bushel for grade No. 1, also grade No. 1 Heavy for No. 1 wheat testing 60 pounds)

Class I, Hard Red Spring Wheat

Grade requirements for—(*a*) Dark Northern Spring, (*b*) Northern Spring, (*c*) Red Spring

Grade No.	Minimum test weight per bushel	Maximum limits of—					
		Damaged kernels (wheat and other grains)		Foreign material		Wheats of other classes	
		Total	Heat damaged	Total	Matter except other grains	Total	Durum and/or Red Durum
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1 heavy [1]	60	2	0.1	1	0.5	5	2
1	58	2	.1	1	.5	5	2
2	57	4	.2	2	1.0	10	3
3	55	7	.5	3	2.0	10	5
4	53	10	1.0	5	3.0	10	10
5	50	15	3.0	7	5.0	10	10
Sample grade	Sample grade wheat shall be wheat of the subclass Dark Northern Spring, or Northern Spring, or Red Spring, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 16 percent moisture, or more than 10 percent cracked kernels; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.						

[1] Applies to each of the subclasses Dark Northern Spring, Northern Spring, and Red Spring.

NOTE.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, Ergoty, and Treated wheat, and for Unnatural Material.

DURUM WHEAT (CLASS II)

This class shall include all varieties of durum wheat except Red Durum, and may include not more than 10 percent of wheats of other classes. This class shall be divided into three subclasses, as follows:

Subclass (a) Amber Durum

This subclass shall include wheat of the class Durum consisting of 75 percent or more of hard and vitreous kernels of amber color.

Subclass (b) Durum

This subclass shall include wheat of the class Durum consisting of 50 percent or more but less than 75 percent of hard and vitreous kernels of amber color.

Subclass (c) Soft Durum

This subclass shall include wheat of the class Durum consisting of less than 50 percent of hard and vitreous kernels of amber color.

RED DURUM WHEAT (CLASS III)

This class shall include all varieties of Red Durum wheat, and may include not more than 10 percent of wheats of other classes.

Class II, Durum Wheat and Class III, Red Durum Wheat

Grade requirements for the subclasses (*a*) Amber Durum, (*b*) Durum, and (*c*) Soft Durum, of the class Durum, and for the class Red Durum

Grade No.	Minimum test weight per bushel	Maximum limits of—					
		Damaged kernels (wheat and other grains)		Foreign material		Wheats of other classes	
		Total	Heat damaged	Total	Matter except other grains	Total	Soft Red Winter and White singly or combined [1]
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	60	2	0.1	1	0.5	[2] 5	2
2	58	4	.2	2	1.0	[3] 10	5
3	56	7	.5	3	2.0	10	10
4	54	10	1.0	5	3.0	10	10
5	51	15	3.0	7	5.0	10	10
Sample grade	Sample grade wheat shall be wheat of the subclass Amber Durum, or Durum, or Soft Durum, or wheat of the class Red Durum, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 16 percent moisture, or more than 10 percent cracked kernels; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.						

[1] These specifications do not apply to the class Red Durum.
[2] The wheat in grade No. 1 Amber Durum, and grade No. 1 Durum, may contain not more than 3 percent of wheat of the class Red Durum.
[3] The wheat in grade No. 2 Amber Durum, and grade No. 2 Durum, may contain not more than 5 percent of wheat of the class Red Durum.

NOTE.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, Ergoty, and Treated wheat, and for Unnatural Material.

HARD RED WINTER WHEAT (CLASS IV)

This class shall include all varieties of hard red winter wheat, and may include not more than 10 percent of wheats of other classes. This class shall be divided into three subclasses, as follows:

Subclass (a) Dark Hard Winter

This subclass shall include wheat of the class Hard Red Winter consisting of 75 percent or more of dark, hard, and vitreous kernels.

Subclass (b) Hard Winter

This subclass shall include wheat of the class Hard Red Winter consisting of less than 75 percent and more than 25 percent of dark, hard, and vitreous kernels.

Subclass (c) Yellow Hard Winter

This subclass shall include wheat of the class Hard Red Winter consisting of not more than 25 percent of dark, hard, and vitreous kernels.

Class IV, Hard Red Winter

Grade requirements for—(*a*) Dark Hard Winter, (*b*) Hard Winter, (*c*) Yellow Hard Winter

Grade No.	Minimum test weight per bushel	Maximum limits of—					
		Damaged kernels (wheat and other grains)		Foreign material		Wheats of other classes	
		Total	Heat damaged	Total	Matter except other grains	Total	Durum and/or Red Durum
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	60	2	0.1	1	0.5	5	0.5
2	58	4	.2	2	1.0	10	1.0
3	56	7	.5	3	2.0	10	2.0
4	54	10	1.0	5	3.0	10	10.0
5	51	15	3.0	7	5.0	10	10.0
Sample grade	Sample grade wheat shall be wheat of the subclass Dark Hard Winter, or Hard Winter, or Yellow Hard Winter, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 15.5 percent moisture, or more than 10 percent cracked kernels; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.						

Note.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, Ergoty, and Treated wheat, and for Unnatural Material.

SOFT RED WINTER WHEAT (CLASS V)

This class shall include all varieties of soft red winter wheat and may include not more than 10 percent of wheats of other classes. This class shall be divided into two subclasses, as follows:

Subclass (a) Red Winter

This subclass shall include wheat of the class Soft Red Winter consisting of both light and dark colored kernels. This subclass shall not include more than 10 percent of Soft Red Winter wheat possessing

the characteristics of wheat of this class as grown west of the Great Plains area of the United States.

Subclass (b) Western Red

This subclass shall include wheat of the class Soft Red Winter consisting of more than 10 percent of wheat of this class grown west of the Great Plains area of the United States or any wheat of this class possessing the characteristics of soft red winter wheat as grown west of the Great Plains area of the United States.

Class V, Soft Red Winter Wheat

Grade requirements for—(*a*) Red Winter, (*b*) Western Red

Grade No.	Minimum test weight per bushel	Maximum limits of—					
		Damaged kernels (wheat and other grains)		Foreign material		Wheats of other classes	
		Total	Heat damaged	Total	Matter except other grains	Total	Durum and/or Red Durum
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	60	2	0.1	1	0.5	5	0.5
2	58	4	.2	2	1.0	10	1.0
3	56	7	.5	3	2.0	10	2.0
4	54	10	1.0	5	3.0	10	10.0
5	51	15	3.0	7	5.0	10	10.0
Sample grade	Sample grade wheat shall be wheat of the subclass Red Winter, or Western Red, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 15.5 percent moisture, or more than 10 percent cracked kernels; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.						

Note.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, Ergoty, and Treated wheat, and for Unnatural Material.

White Wheat (Class VI)

This class shall include all varieties of white wheat, whether winter or spring grown, and may include not more than 10 percent of wheats of other classes. This class shall be divided into four subclasses, as follows:

Subclass (a) Hard White

This subclass shall include all wheat of the class White consisting of 75 percent or more of hard (not soft and chalky) kernels. This subclass shall not include more than 10 percent of Sonora wheat or wheat of the white club varieties, either singly or in any combination.

Subclass (b) Soft White

This subclass shall include wheat of the class White consisting of less than 75 percent of hard (not soft and chalky) kernels. This subclass shall not include more than 10 percent of Sonora wheat or wheat of the white club varieties, either singly or in any combination.

Subclass (c) White Club

This subclass shall include wheat of the class White consisting of Sonora wheat or wheat of the white club varieties, either singly or in any combination. This subclass shall not include more than 10 percent of common white wheat other than Sonora, either singly or in any combination.

Subclass (d) Western White

This subclass shall include wheat of the class White which contains more than 10 percent of Sonora wheat or wheat of the white club varieties, either singly or in any combination, and which also contains more than 10 percent of common white wheat other than Sonora.

Class VI, White Wheat

Grade requirements for—(*a*) Hard White, (*b*) Soft White, (*c*) White Club, (*d*) Western White

Grade No.	Minimum test weight per bushel	Maximum limits of—					
		Damaged kernels (wheat and other grains)		Foreign material		Wheats of other classes	
		Total	Heat damaged	Total	Matter except other grains	Total	Durum and/or Red Durum
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	60	2	0.1	1	0.5	5	0.5
2	58	4	.2	2	1.0	10	1.0
3	56	7	.5	3	2.0	10	2.0
4	54	10	1.0	5	3.0	10	10.0
5	51	15	3.0	7	5.0	10	10.0
Sample grade	Sample grade wheat shall be wheat of the subclass Hard White, or Soft White, or White Club, or Western White, which does not come within the requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 15.5 percent moisture, or more than 10 percent cracked kernels; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.						

Note.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, Ergoty, and Treated wheat, and for Unnatural Material.

Mixed Wheat (Class VII)

This class shall include all mixtures of wheat not provided for in the classes from I to VI, inclusive.

Grades for Mixed Wheat.—Mixed Wheat shall be graded according to the numerical and sample grade requirements of the class of wheat which predominates in the mixture, except that the grade specifications for the factor "wheats of other classes" (and for Plan B the grade specifications for "No. 1 Heavy" in the standards for hard red spring wheat), shall be disregarded.

The grade designation for Mixed Wheat shall be stated as provided in either paragraph (*a*) or (*b*) of this section:

(*a*) Except as specified in paragraph (*b*) of this section, the grade designation for Mixed Wheat shall include successively, in the order named, (1) the number of the grade or the words "Sample grade" as the case may be, (2) the words "Mixed Wheat", and (3) the name and approximate percentage of each class of wheat which constitutes

more than 10 percent of the mixture in the order of its predominance; but if only one class exceeds 10 percent of the mixture, the name and approximate percentage of that class shall be included in the grade designation, followed by the name and approximate percentage of at least one other class.

(*b*) *Mixed Durum.*—Mixed Durum shall be mixed wheat consisting of 70 percent or more of durum other than Red Durum, and may contain not more than 20 percent of Red Durum and not more than 5 percent of soft red winter and/or white wheat. The grade designation for Mixed Durum shall include successively, in the order named, (1) the number of the grade or the words "Sample grade", as the case may be, and (2) the words "Mixed Durum".

SPECIAL GRADES FOR WHEAT

Special grades shall be grades other than the unqualified numerical grades 1 to 5, inclusive, and Sample grade, and shall be added to and made a part of such grades when applicable.

Dockage

Dockage includes weed seeds, weed stems, chaff, straw, grain other than wheat, sand, dirt, and any other foreign material which can be removed readily from the wheat by the use of such appropriate sieves and cleaning devices as are approved by the Secretary of Agriculture; also undeveloped, shriveled, and small pieces of wheat kernels removed in properly separating the foreign material, and which cannot be recovered by properly rescreening or recleaning.

The quantity of dockage shall be calculated in terms of percentage based on the total weight of the grain including the dockage. The percentage of dockage so calculated, when equal to 1 percent or more, shall be stated in terms of whole percent, and when less than 1 percent shall not be stated. A fraction of a percent shall be disregarded. The word "Dockage", together with the percentage thereof, shall be added to and made a part of the grade designation.

Tough Wheat

Tough wheat shall be (*a*) wheat of either of the classes Hard Red Winter, Soft Red Winter, or White, or of the class Mixed Wheat in which wheat of any one of the classes Hard Red Winter, Soft Red Winter, or White, predominates, which contains more than 14 percent but not more than 15.5 percent of moisture, and (*b*) wheat of any of the classes Hard Red Spring, or Durum, or Red Durum, or of the class Mixed Wheat in which wheat of any of the classes Hard Red Spring, or Durum, or Red Durum, predominates, which contains more than 14.5 percent but not more than 16 percent of moisture.

Grades for Tough wheat.—Tough wheat shall be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not tough, and there shall be added to and made a part of the grade designation the word "Tough".

Smutty Wheat

Smutty wheat shall be wheat which has an unmistakable odor of smut, or which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 15 balls of average size in 250 grams of wheat.

Smutty wheat shall be graded and designated according to the method described either in paragraph (*a*) or paragraph (*b*) of this section.

(*a*) *Smut dockage.*—Before the determination of smut dockage as provided in this paragraph, the wheat shall be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not smutty. The loss in weight caused by the removal of smut from the wheat shall be ascertained by scouring, and shall be calculated in terms of percentage based on the total weight of the grain free from dockage. The percentage so calculated shall be stated in terms of whole percent and half percent. A fraction of a percent when equal to, or greater than, a half shall be treated as a half, and when less than a half shall be disregarded. The percentage of the smut dockage, so calculated and stated, shall be added to, and made a part of, the grade designation, preceding the statement of dockage, if any.

(*b*) *Light Smutty and Smutty wheat.*—Smutty wheat shall be divided into Light Smutty, and Smutty wheat.

Light Smutty wheat shall be wheat which has an unmistakable odor of smut, or which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 15 balls but not in excess of 30 balls of average size in 250 grams of wheat.

Smutty wheat shall be wheat which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 30 balls of average size in 250 grams of wheat.

Grade designations for Light Smutty and Smutty wheat.—Light Smutty, and Smutty wheat shall each be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not smutty, and there shall be added to, and made a part of, the grade designation, either the words "Light Smutty", or the word "Smutty", as the case may be.

Garlicky Wheat

Garlicky wheat shall be wheat which has an unmistakable odor of garlic or wild onions, or which contains garlic or wild onion bulblets in excess of a quantity equal to one newly harvested bulblet of average size in 1,000 grams of wheat.[2] Garlicky wheat shall be divided into Light Garlicky, Medium Garlicky, and Garlicky wheat.

Light Garlicky wheat shall be wheat which has an unmistakable odor of garlic or wild onions, or which contains garlic or wild onion bulblets in excess of a quantity equal to 1 but not in excess of a quantity equal to 5 newly harvested bulblets of average size in 1,000 grams of wheat.

Medium Garlicky wheat shall be wheat which contains garlic or wild onion bulblets in excess of a quantity equal to 5 but not in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of wheat.

Garlicky wheat shall be wheat which contains garlic or wild onion bulblets in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of wheat.

Grades for Light Garlicky, Medium Garlicky, and Garlicky wheat.—Light Garlicky, Medium Garlicky, and Garlicky wheat, shall each

[2] In inspection procedure, the equivalency of dry bulbs in terms of newly harvested bulbs would be determined on a weight basis.

be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not garlicky, and there shall be added to, and made a part of, the grade designation, the words "Light Garlicky", "Medium Garlicky", or the word "Garlicky", as the case may be.

Weevily Wheat

Weevily wheat shall be wheat which is infested with live weevils or other insects injurious to stored grain.

Grades for Weevily wheat.—Weevily wheat shall be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily".

Ergoty Wheat

Ergoty wheat shall be wheat which contains ergot in excess of 0.3 percent.

Grades for Ergoty wheat.—Ergoty wheat shall be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not ergoty, and there shall be added to, and made a part of, the grade designation, the word "Ergoty".

Treated Wheat

Treated wheat shall be wheat which has been scoured, limed, washed, sulphured, or treated in such a manner that its true quality is not reflected by either the numerical grade or Sample grade designation, alone.

Grades for Treated wheat.—Treated wheat shall be graded and designated according to the grade requirements of the standards applicable to such wheat if it were not treated, and there shall be added to, and made a part of, the grade designation, a statement indicating the kind of treatment.

Unnatural Material

Unnatural Material shall be kernels and pieces of kernels of corn, grain sorghums, nongrain sorghums, and soybeans, and other matter except wheat not grown naturally with wheat. Unnatural material shall not include sand, dirt, stones, and cinders.

Grades for Unnatural Material.—Wheat which, before the removal of dockage, contains unnatural material in excess of 0.3 percent, shall be graded and designated according to the grade requirements applicable to such wheat if it did not contain unnatural material, and there shall be added to, and made a part of, the grade designation, preceding the statement of dockage, if any, the words "Unnatural Material."[3]

DEFINITIONS

Basis of determinations.—Each determination of dockage, unnatural material, moisture, temperature, odor, garlic, and live weevils or other insects injurious to stored grain, shall be upon the basis of the grain including dockage. All other determinations shall be upon the basis of the grain when free from dockage.

[3] See proposed certification regulations for wheat which would require licensed inspectors to embody under Remarks in all certificates issued by them for wheat, except those issued for export shipments, a statement of the words "Unnatural Material" and the kind or kinds, together with a percentage statement of the total quantity thereof.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall include all matter other than wheat which is not separated from the wheat in the proper determination of dockage, except that smut balls shall not be considered as foreign material.[4]

Other grains.—Other grains shall include rye, oats, corn, grain sorghums, barley, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Damaged kernels.—Damaged kernels shall be kernels and pieces of kernels of wheat and other grains which are heat damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of wheat and other grains which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

Cracked kernels.—Cracked kernels shall be broken kernels of wheat and other grains remaining after the removal of dockage which, in sieving, will pass through a metal sieve with slotted perforations 0.064 inch wide by three eighths of an inch long.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks, in all certificates issued by them for wheat, unless issued for an export shipment, a statement of:

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis;

(*b*) *Test weight per bushel.*—The test weight per bushel, in terms of pounds and tenths of a pound;

(*c*) *Moisture content.*—The percentage of moisture;

(*d*) *Unnatural Material.*—The words "Unnatural Material" followed by the name of the kind or kinds and by a percentage statement of the total quantity thereof, for all lots of wheat graded under the provisions of the special grade "Unnatural Material."

[4] Explanatory note.—That portion of the unnatural material which is not separated as dockage functions as foreign material, as well as a portion of the unnatural material.

PROPOSED RYE STANDARDS[5]

(Not official standards)

For the purpose of the proposed grain standards of the United States for rye:

Rye.—Rye shall be any grain which, before the removal of dockage, consists of 50 percent or more of rye, and not more than 10 percent of other grains for which standards have been established under the provisions of the Grain Standards Act.

Grades.—Rye shall be graded and designated according to the respective grade requirements of the numerical grades and sample grade, and according to the special grades when applicable.

Rye

Grade requirements for rye

Grade No.	Minimum test weight per bushel	Maximum limits of—			
		Damaged kernels (Rye and other grains)		Foreign material	
		Total	Heat damaged	Total	Foreign matter other than wheat
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*
1	56	2	0.1	3	1
2	54	4	.2	6	2
3	52	7	.5	10	4
4	49	15	3.0	10	6
Sample grade	Sample grade rye shall be rye which does not come within the requirements of any of the grades from No. 1 to No. 4, inclusive; or which contains more than 16 percent moisture; or which contains inseparable stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.				

NOTE.—See also special grades for Dockage, and for Tough, Smutty, Garlicky, Weevily, and Ergoty rye, and for Unnatural Material.

SPECIAL GRADES FOR RYE

Special grades shall be grades other than the unqualified numerical grades 1 to 4, inclusive, and Sample grade, and shall be added to and made a part of such grades when applicable.

DOCKAGE

Dockage includes weed seeds, weed stems, chaff, straw, grain other than rye, sand, dirt, and any other foreign material, which can be removed readily from the rye by the use of such appropriate sieves and cleaning devices as are approved by the Secretary of Agriculture; also undeveloped, shriveled, and small pieces of rye kernels which are

[5] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

removed in properly separating the foreign material, and which cannot be recovered by properly rescreening or recleaning.

The quantity of dockage shall be calculated in terms of percentage based on the total weight of the grain including the dockage. The percentage of dockage so calculated, when equal to 1 percent or more, shall be stated in terms of whole percent, and when less than 1 percent shall not be stated. A fraction of a percent shall be disregarded. The word "Dockage", together with the percentage thereof, shall be added to and made a part of the grade designation.

Tough Rye

Tough rye shall be rye which contains more than 14 percent but not more than 16 percent of moisture.

Grades for Tough rye.—Tough rye shall be graded and designated according to the grade requirements of the standards applicable to such rye if it were not tough, and there shall be added to, and made a part of, the grade designation, the word "Tough".

Smutty Rye

Smutty rye shall be rye which has an unmistakable odor of smut, or which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 15 balls of average size in 250 grams of rye. Smutty rye shall be divided into Light Smutty and Smutty rye.

Light Smutty rye shall be rye which has an unmistakable odor of smut, or which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 15 balls but not in excess of 30 balls of average size in 250 grams of rye.

Smutty rye shall be rye which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 30 balls of average size in 250 grams of rye.

Grades for Light Smutty and Smutty rye.—Light Smutty and Smutty rye shall each be graded and designated according to the grade requirements of the standards applicable to such rye if it were not smutty, and there shall be added to, and made a part of, the grade designation, either the words "Light Smutty" or the word "Smutty", as the case may be.

Garlicky Rye

Garlicky rye shall be rye which has an unmistakable odor of garlic or wild onions, or which contains garlic or wild onion bulblets in excess of a quantity equal to one newly harvested bulblet of average size in 1,000 grams of rye.[6] Garlicky rye shall be divided into Light Garlicky, Medium Garlicky, and Garlicky rye.

Light Garlicky rye shall be rye which has an unmistakable odor of garlick or wild onions, or contains garlic or wild onion bulblets in excess of a quantity equal to one but not in excess of a quantity equal to five newly harvested bulblets of average size in 1,000 grams of rye.

Medium Garlicky rye shall be rye which contains garlic or wild onion bulblets in excess of a quantity equal to 5 but not in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of rye.

[6] Dry bulblet interpretation, see Garlicky wheat.

Garlicky rye shall be rye which contains garlic or wild onion bulblets in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of rye.

Grades for Light Garlicky, Medium Garlicky, and Garlicky rye.—Light Garlicky, Medium Garlicky, and Garlicky rye shall each be graded and designated according to the grade requirements of the standards applicable to such rye if it were not garlicky, and there shall be added to, and made a part of, the grade designation the words "Light Garlicky", "Medium Garlicky", or the word "Garlicky", as the case may be.

Weevily Rye

Weevily rye shall be rye which is infested with live weevils or other insects injurious to stored grain.

Grades for Weevily rye.—Weevily rye shall be graded and designated according to the grade requirements of the standards applicable to such rye if it were not weevily, and there shall be added to, and made a part of, the grade designation the word "Weevily".

Ergoty Rye

Ergoty rye shall be rye which, after the removal of dockage, contains ergot in excess of 0.3 percent.

Grades for Ergoty rye.—Ergoty rye shall be graded and designated according to the grade requirements of the standards applicable to such rye if it were not ergoty, and there shall be added to, and made a part of, the grade designation the word "Ergoty".

Unnatural Material

Unnatural Material shall be kernels and pieces of kernels of corn, grain sorghums, nongrain sorghums, and soybeans, and other matter except rye not grown naturally with rye. Unnatural material shall not include sand, dirt, stones, and cinders.

Grades for Unnatural Material.—Rye which, before the removal of dockage, contains unnatural material in excess of 0.3 per cent shall be graded and designated according to the grade requirements applicable to such rye if it did not contain unnatural material, and there shall be added to, and made a part of, the grade designation, preceding the statement of dockage, if any, the words "Unnatural Material".[7]

DEFINITIONS

Basis of determinations.—Each determination of dockage, unnatural material, moisture, temperature, odor, garlic, and live weevils or other insects injurious to stored grain, shall be upon the basis of the grain including dockage. All other determination shall be upon the basis of the grain when free from dockage.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United

[7] See proposed certification regulations for rye which would require licensed inspectors to embody under Remarks in all certificates issued by them for rye, except those issued for export shipments, a statement of the words "Unnatural Material" and the kind or kinds, together with a percentage statement of the total quantity thereof.

States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall include all matter other than rye, which is not separated from the rye in the proper determination of dockage, except that smut balls shall not be considered as foreign material.[8]

Other grains.—Other grains shall include wheat, oats, corn, grain sorghums, barley, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Damaged kernels.—Damaged kernels shall be kernels and pieces of kernels of rye and other grains which are heat damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of rye and other grains which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under remarks, in all certificates issued by them for rye, unless issued for an export shipment, a statement of:

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis;

(*b*) *Test weight per bushel.*—The test weight per bushel, in terms of pounds and tenths of a pound;

(*c*) *Moisture content.*—The percentage of moisture for every lot which is graded Tough, or Sample grade on account of moisture;

(*d*) *Unnatural Material.*—The words "Unnatural Material" followed by the name of the kind or kinds and by a percentage statement of the total quantity thereof, for all lots of rye graded under the provisions of the special grade Unnatural Material.

PROPOSED OATS STANDARDS[9]

(Not official standards)

For the purpose of the proposed grain standards of the United States for oats:

Oats.—Oats shall be any grain which consists of 80 percent or more of cultivated oats. Oats may contain not more than 10 percent of

[8] That portion of the unnatural material which is not separated as dockage functions as foreign material as well as a portion of the unnatural material.

[9] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

wild oats, and may contain not more than 20 percent of other grains for which standards have been established under the provisions of the Grain Standards Act.

Classes.—Oats shall be divided into five classes as follows: Class I, White; Class II, Red; Class III, Gray; Class IV, Black; and Class V, Mixed Oats. For the purpose of this classification, the color characteristics of each class, except Mixed Oats, shall be based on variety characteristics; White oats shall include yellow oats; and tinges of white or black on the kernels of any red oats variety shall not affect their classification as red oats. Oats of any class except Mixed Oats may include not more than 10 percent of cultivated oats of other classes. Mixed Oats shall be any mixture of oats which do not meet the requirements for any one of the classes White, Red, Gray, or Black oats.

Grades.—Oats shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade of the class to which they belong, and according to the special grades when applicable.

Oats

Grade requirements for the classes White, Red, Gray, Black, and Mixed Oats

Grade No.	Minimum limits of—		Maximum limits of—			
	Test weight per bushel	Sound cultivated oats	Heat-damaged kernels (oats, other grains, and wild oats)	Foreign material	Wild oats	Oats of other classes [1]
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	32	97	0.1	2	2	[2] 5
2	30	94	.3	2	3	[3] 10
3	27	90	1.0	3	5	10
4	24	80	3.0	5	10	10
Sample grade	Sample grade oats shall be oats of any one of the classes White, Red, Gray, Black, or Mixed Oats, which do not come within the requirements of any of the grades from No. 1 to No. 4, inclusive; or which contain more than 16 percent moisture; or which contain stones and/or cinders; or which are musty, or sour, or heating, or hot; or which have any commercially objectionable foreign odor except of smut or garlic; or which are otherwise of distinctly low quality.					

[1] Does not apply to Mixed oats.
[2] The oats in grade No. 1 White oats may contain not more than 3 percent of black cultivated oats.
[3] The oats in grade No. 2 White oats may contain not more than 5 percent of black cultivated oats.

NOTE.—See also special grades for Tough, Heavy, Extra Heavy, Stained, Weathered, Cereal, Bleached, Weevily, Smutty, Ergoty, and Garlicky oats, and for Unnatural Material.

SPECIAL GRADES FOR OATS

Special grades shall be grades other than the unqualified numerical grades 1 to 4, inclusive, and Sample grade, and shall be added to, and made a part of, such grades when applicable.

TOUGH OATS

Tough oats shall be oats which contain more than 14.5 percent but not more than 16 percent of moisture.

Grades for Tough oats.—Tough oats shall be graded and designated according to the grade requirements of the standards applicable to

such oats if they were not tough, and there shall be added to, and made a part of, the grade designation, the word "Tough."

Heavy Oats

Heavy oats shall be oats which have a test weight per bushel of 35 pounds or more but less than 38 pounds.

Grades for Heavy oats.—Heavy oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not heavy, and there shall be added to, and made a part of, the grade designation, preceding the name of the class, the word "Heavy."

Extra Heavy Oats

Extra Heavy oats shall be oats which have a test weight per bushel of 38 pounds or more.

Grades for Extra Heavy oats.—Extra Heavy oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not extra heavy, and there shall be added to, and made a part of, the grade designation, preceding the name of the class, the words "Extra Heavy."

Stained Oats

Stained oats shall be oats, except Bleached oats, which are stained,[10] but which are not badly stained or weathered.

Grades for Stained oats.—Stained oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not stained, and there shall be added to, and made a part of, the grade designation, the word "Stained".

Weathered Oats

Weathered oats shall be oats, except bleached oats, which are badly stained or weathered.

Grades for Weathered oats.—Weathered oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not weathered, and there shall be added to, and made a part of, the grade designation, the word "Weathered".

Cereal Oats

Cereal oats shall be oats which have been sized with the result that their commerical quality is not reflected by either the numerical grade or Sample grade designation alone.

Grades for Cereal oats.—Cereal oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not cereal oats, and there shall be added to, and made a part of, the grade designation, the word "Cereal".

Bleached Oats

Bleached oats shall be oats which, in whole or in part, have been treated by the use of sulphurous acid or other bleaching chemical.

[10] Oats of the unqualified numerical grades and Sample grade may be slightly stained or slightly weathered.

Grades for Bleached oats.—Bleached oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not bleached, and there shall be added to, and made a part of, the grade designation, the word "Bleached".

Weevily Oats

Weevily oats shall be oats which are infested with live weevils or other insects injurious to stored grain.

Grades for Weevily oats.—Weevily oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily".

Smutty Oats

Smutty oats shall be oats which contain balls, portions of balls, or spores of smut, in a quantity in excess of 30 balls of average size in 250 grams of oats.

Grades for Smutty oats.—Smutty oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not smutty, and there shall be added to, and made a part of, the grade designation, the word "Smutty".

Unnatural Material

Unnatural Material shall be kernels and pieces of kernels of corn, grain sorghums, nongrain sorghums, and soybeans, and other matter except oats not grown naturally with oats. Unnatural material shall not include sand, dirt, stones, and cinders.

Grades for Unnatural Material.—Oats which contain unnatural material in excess of 0.5 percent, shall be graded and designated according to the grade requirements applicable to such oats if they did not contain unnatural material, and there shall be added to, and made a part of, the grade designation, the words "Unnatural Material".[11]

Ergoty Oats

Ergoty oats shall be oats which contain ergot in excess of 0.3 percent.

Grades for Ergoty oats.—Ergoty oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not ergoty, and there shall be added to, and made a part of, the grade designation, the word "Ergoty".

Garlicky Oats

Garlicky oats shall be oats which contain garlic or wild onion bulblets in excess of a quantity equal to three newly harvested bulblets of average size in 500 grams of oats.[12]

Grades for Garlicky oats.—Garlicky oats shall be graded and designated according to the grade requirements of the standards applicable to such oats if they were not garlicky, and there shall be added to, and made a part of, the grade designation, the word "Garlicky".

[11] See proposed certification regulations for oats which would require licensed inspectors to embody under Remarks in all certificates issued by them for oats, except those issued for export shipments, a statement of the words "Unnatural Material" and the kind or kinds together with a percentage statement of the total quantity thereof.

[12] Dry bulblet interpretation—see Garlicky wheat.

DEFINITIONS

Basis of determinations.—All determinations shall be upon the basis of the lot of grain as a whole, including foreign material, other grains, and wild oats.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall be all matter except kernels and pieces of kernels of cultivated oats, other grains, and wild oats, but shall include oats clippings and detached hulls.

Other grains.—Other grains shall include wheat, rye, corn, grani sorghums, barley, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Sound cultivated oats.—Sound cultivated oats shall be all kernels and pieces of kernels of cultivated oats which are not heat-damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of cultivated oats, other grains, and wild oats, which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks, in all certificates issued by them for oats, unless issued for an export shipment, a statement of:—

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis;

(*b*) *Test weight per bushel.*—The test weight per bushel in terms of whole and half pounds;

(*c*) *Moisture content.*—The percentage of moisture for every lot of oats which is graded Tough, or Sample grade on account of moisture;

(*d*) *Unnatural Material.*—The words "Unnatural Material" followed by the name of the kinds and by a percentage statement of the total quantity thereof, for all lots of oats graded under the provisions of the special grade Unnatural Material.

PROPOSED FEED OATS STANDARDS [13]

(Not official standards)

For the purpose of the proposed grain standards of the United States for feed oats:

Feed Oats.—Feed Oats shall be any grain which consists of either (*a*) 30 percent or more but less than 80 percent of cultivated oats, but not less than 65 percent of cultivated and wild oats combined, or (*b*) 80 percent or more of cultivated oats and more than 10 percent of wild oats. Feed Oats may contain not more than 25 percent of other grains, and may contain not more than 10 percent of foreign material, which 10 percent may include not more than 5 percent of fine seeds.

Grades.—Feed Oats shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade, and according to the special grades when applicable.

Feed Oats

[Grade requirements for Feed Oats]

Grade No.	Minimum limits of—		Maximum limits of—		
	Test weight per bushel	Cultivated oats	Heat-damaged kernels (oats, wild oats, and other grains)	Foreign material	
				Total	Fine seeds
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*
1	32	60	2	3	2
2	29	45	4	4	3
3	26	30	6	6	4
Sample grade	Sample grade Feed Oats shall be feed oats which do not come within the requirements of any of the grades from No. 1 to No. 3, inclusive; or which contain more than 16 percent moisture; or which are musty, or sour, or heating, or hot; or which are badly weathered; or which have any commercially objectionable foreign odor except of smut; or which are otherwise of distinctly low quality.				

NOTE.—See also special grades for Tough, Stained, Bleached, Weevily, Smutty, and Ergoty Feed Oats.

SPECIAL GRADES FOR FEED OATS

Special grades shall be grades other than the unqualified numerical grades 1 to 3, inclusive, and Sample grade, and shall be added to, and made a part of, such grades when applicable.

TOUGH FEED OATS

Tough Feed Oats shall be feed oats which contain more than 14.5 percent but not more than 16 percent of moisture.

Grades for Tough Feed oats.—Tough Feed oats shall be graded and designated according to the grade requirements of the standards applicable to such feed oats if they were not tough, and there shall be added to, and made a part of, the grade designation, the word "Tough".

[13] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

Stained Feed Oats

Stained Feed Oats shall be feed oats, except bleached feed oats, which are stained,[14] or which are weathered but not badly weathered.[15]

Grades for Stained Feed Oats.—Stained Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such feed oats if they were not stained, and there shall be added to, and made a part of, the grade designation, the word "Stained".

Bleached Feed Oats

Bleached Feed Oats shall be feed oats which in whole or in part have been treated by the use of sulphurous acid or other bleaching chemical.

Grades for Bleached Feed Oats.—Bleached Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such feed oats if they were not bleached, and there shall be added to, and made a part of, the grade designation, the word "Bleached".

Weevily Feed Oats

Weevily Feed Oats shall be feed oats which are infested with live weevils or other insects injurious to stored grain.

Grades for Weevily Feed Oats.—Weevily Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such feed oats if they were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily".

Smutty Feed Oats

Smutty Feed Oats shall be feed oats which contain balls, portions of balls, or spores, of smut, in a quantity in excess of 30 balls of average size in 250 grams of feed oats.

Grades for Smutty Feed Oats.—Smutty Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such feed oats if they were not smutty, and there shall be added to, and made a part of, the grade designation, the word "Smutty".

Ergoty Feed Oats

Ergoty Feed Oats shall be feed oats which contain ergot in excess of 0.3 percent.

Grades for Ergoty Feed Oats.—Ergoty Feed oats shall be graded and designated according to the grade requirements of the standards applicable to such feed oats if they were not ergoty, and there shall be added to, and made a part of, the grade designation, the word "Ergoty".

DEFINITIONS

Basis of determinations.—All determinations shall be upon the basis of the lot of grain as a whole, including foreign material, other grains, and wild oats.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

[14] Feed Oats of the unqualified numerical grades and Sample grade may be slightly stained or slightly weathered.

[15] Feed Oats that are badly weathered are graded Sample grade, account badly weathered.

Percentage of moisture.—Percentage of moisture shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall be all matter except kernels and pieces of kernels of cultivated oats, other grains, and wild oats, but shall include oats clippings and detached hulls.

Other grains.—Other grains shall include wheat, rye, corn, grain sorghums, barley, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of cultivated oats, wild oats, and other grains, which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks, in all certificates issued by them for Feed Oats, unless issued for an export shipment, a statement of—

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis;

(*b*) *Test weight per bushel.*—The test weight per bushel in terms of whole and half pounds;

(*c*) *Moisture content.*—The percentage of moisture for every lot which is graded Tough, or Sample grade on account of moisture.

PROPOSED MIXED FEED OATS STANDARDS [16]

(Not official standards)

For the purpose of the proposed grain standards of the United States for mixed feed oats:

Mixed Feed Oats.—Mixed Feed Oats shall be any grain which consists of less than 30 percent of cultivated oats, but not less than 65 percent of either cultivated and wild oats combined or wild oats alone; may contain not more than 25 percent of other grains; and may contain not more than 10 percent of foreign material, which 10 percent may include not more than 5 percent of fine seeds.

Grades.—Mixed Feed Oats shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade, and according to the special grades when applicable.

[16] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

Mixed Feed Oats

Grade requirements for Mixed Feed Oats

Grade No.	Minimum test weight per bushel	Maximum limits of—		
		Heat-damaged kernels (oats, wild oats, and other grains)	Foreign material	
			Total	Fine seeds
	Pounds	*Percent*	*Percent*	*Percent*
1	32	2	5	2
2	29	4	7	3
3	26	6	10	4
Sample grade	Sample grade Mixed Feed Oats shall be mixed feed oats which do not come within the requirements of any of the grades from No. 1 to No. 3, inclusive; or which contain more than 16 percent moisture; or which are musty, or sour, or heating, or hot; or which are badly weathered; or which have any commercially objectionable foreign odor except of smut; or which are otherwise of distinctly low quality.			

NOTE.—See also special grades for Tough, Stained, Bleached, Weevily, Smutty, and Ergoty Mixed Feed Oats.

SPECIAL GRADES FOR MIXED FEED OATS

Special grades shall be grades other than the unqualified numerical grades 1 to 3, inclusive, and Sample grade, and shall be added to, and made a part of, such grades when applicable.

Tough Mixed Feed Oats

Tough Mixed Feed Oats shall be mixed feed oats which contain more than 14.5 percent but not more than 16 percent of moisture.

Grades for Tough Mixed Feed Oats.—Tough Mixed Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such mixed feed oats if they were not tough, and there shall be added to, and made a part of, the grade designation, the word "Tough."

Stained Mixed Feed Oats

Stained Mixed Feed Oats shall be mixed feed oats, except Bleached Mixed Feed Oats, which are stained,[17] or which are weathered but not badly weathered.[18]

Grades for Stained Mixed Feed Oats.—Stained Mixed Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such mixed feed oats if they were not stained, and there shall be added to, and made a part of, the grade designation, the word "Stained."

Bleached Mixed Feed Oats

Bleached Mixed Feed Oats shall be mixed feed oats which in whole or in part have been treated by the use of sulphurous acid or other bleaching chemical.

[17] Mixed Feed Oats of the unqualified numerical grades and Sample grade may be slightly stained or slightly weathered.

[18] Mixed Feed Oats that are badly weathered are graded Sample grade, account badly weathered.

Grades for Bleached Mixed Feed Oats.—Bleached Mixed Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such mixed feed oats if they were not bleached, and there shall be added to, and made a part of, the grade designation, the word "Bleached."

Weevily Mixed Feed Oats

Weevily Mixed Feed Oats shall be mixed feed oats which are infested with live weevils or other insects injurious to stored grain.

Grades for Weevily Mixed Feed Oats.—Weevily Mixed Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such mixed feed oats if they were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily."

Smutty Mixed Feed Oats

Smutty Mixed Feed Oats shall be mixed feed oats which contain balls, portions of balls, or spores, of smut, in a quantity in excess of 30 balls of average size in 250 grams of mixed feed oats.

Grades for Smutty Mixed Feed Oats.—Smutty Mixed Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such mixed feed oats if they were not smutty, and there shall be added to, and made a part of, the grade designation, the word "Smutty."

Ergoty Mixed Feed Oats

Ergoty Mixed Feed Oats shall be mixed feed oats which contain ergot in excess of 0.3 percent.

Grades for Ergoty Mixed Feed Oats.—Ergoty Mixed Feed Oats shall be graded and designated according to the grade requirements of the standards applicable to such mixed feed oats if they were not ergoty, and there shall be added to, and made a part of, the grade designation, the word "Ergoty".

DEFINITIONS

Basis of determinations.—All determinations shall be upon the basis of the lot of grain as a whole, including foreign material, other grains, and wild oats.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall be all matter except kernels and pieces of kernels of cultivated oats, other grains, and wild oats, but shall include oats clippings and detached hulls.

Other grains.—Other grains shall include wheat, rye, corn, grain sorghums, barley, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of cultivated oats, wild oats, or other grains, which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks, in all certificates issued by them for Mixed Feed Oats, unless issued for an export shipment, a statement of:

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis;

(*b*) *Test weight per bushel.*—The test weight per bushel in terms of whole and half pounds;

(*c*) *Moisture content.*—The percentage of moisture for every lot which is graded Tough or Sample grade on account of moisture.

PROPOSED BARLEY STANDARDS [19]

(Not official standards)

For the purpose of the proposed grain standards of the United States for barley:

Barley.—Barley shall be any grain which, before the removal of dockage, consists of 50 percent or more of barley, and may contain not more than 25 percent of other grains for which standards have been established under the provisions of the Grain Standards Act. The term barley in these standards shall not include hull-less barley.

Classes.—Barley shall be divided into four classes, as follows: Class I, Barley; Class II, Black Barley; Class III, Western Barley; and Class IV, Mixed Barley.

Grades.—Barley shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade of the class to which it belongs, and according to the special grades when applicable.

BARLEY (CLASS I)

This class shall include all white (glumes) barley possessing the characteristics of white barley grown east of the Rocky Mountains and may include not more than 10 percent of barley of other classes. This class shall be divided into two subclasses as follows:

Subclass (a) Malting Barley

This subclass shall include 6-rowed barley of the class Barley (Class I) which meets the requirements of grades Nos. 1 to 3, inclusive,

[19] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

which after the removal of dockage, contains not more than 5 percent of 2-rowed and/or other types or varieties of barley of unrecognized malting type, such as Trebi, so-called "Coast" or "Bay-brewing", and Black; which contains not more than 20 percent of kernels that will pass through a sieve with slotted perforations one fourteenth of an inch wide and one half inch long;[20] which contains 80 percent or more of mellow kernels; which contains not more than 6 percent of skinned and/or broken kernels of which not more than 3 percent may be skinned kernels and/or hull-less barley; which contains not more than 2 percent of unsound grain of all kinds; and shall not include barley which is Weevily, Stained, Bleached, Blighted, or clipped.

Subclass (b) Barley

This subclass shall include all barley of the class Barley which does not meet the requirements of subclass (*a*) Malting Barley.

BLACK BARLEY (CLASS II)

This class shall include all varieties of black (glumes) barley grown anywhere in the United States, and may include not more than 10 percent of barley of other classes.

Class I, Barley and Class II, Black Barley

Grade requirements for—Subclass (*a*) Malting Barley and subclass (*b*) Barley of the class Barley, and for the class Black Barley

Grade No.	Minimum limits of—		Maximum limits of—			
	Test weight per bushel	Sound barley	Heat-damaged kernels (barley, other grains, and wild oats)	Foreign material	Broken kernels	Black barley [1]
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1 [2]	47	95	0.1	1	3	0.5
2 [2]	46	93	.2	2	6	1.0
3 [2]	43	90	.5	3	10	2.0
4	40	80	1.0	4	20	5.0
5	35	70	3.0	6	30	10.0
Sample grade	Sample grade barley shall be barley of the subclass Malting Barley, or of the subclass Barley, or of the class Black Barley, which does not come within the grade requirements of any of the grades from No. 1 to No. 5, inclusive; or which contains more than 16 percent moisture; or which contains inseparable stones and/or cinders; or which is musty, sour, heating, or hot; or which contains more than 5 percent of barley damaged or materially discolored by blight and/or mold; or which has any commercially objectionable foreign odor except of smut or garlic; or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality.					

[1] These specifications do not apply to the class Black Barley.
[2] See special requirements for subclass (*a*) Malting Barley, p. 26.

NOTE.—See also special grades for Dockage, and for 2-rowed, Tough, Bright, Stained, Blighted, Smutty, Garlicky, Weevily, Ergoty, and Bleached barley, and for Unnatural Material.

[20] Other "sizing" specifications that merit public consideration are: "Which contains 20 percent or more of kernels that will not pass through a sieve with slotted perforations six sixty fourths of an inch wide and three fourths of an inch long and not more than 20 percent of kernels that will pass through a sieve with slotted perforations one fourteenth of an inch wide and one half an inch long". These specifications, based on two sieves, would measure the average, natural, kernel-size quality of country-run barley better than specifications based on one sieve only, but would double the hazard of inspection variations between markets or inspectors, and, in some crop years, might restrict the volume of barley that would come within the classification for Malting Barley. Thus, certain advantages and disadvantages are inherent in sizing specifications based either on one sieve or on two sieves.

WESTERN BARLEY (CLASS III)

This class shall include white (glumes) barley possessing the characteristics of white barley grown west of the Great Plains area of the United States, and may include not more than 10 percent of barley of other classes.

Class III, Western Barley

Grade requirements for Western Barley

Grade No.	Minimum limits of—	Maximum limits of—				
	Sound barley	Heat-damaged kernels (barley, other grains, and wild oats)	Wild oats	Foreign material	Broken kernels	Black barley
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	98	0.1	1	0.5	3	0.5
2	96	.2	2	1.0	6	1.0
3	93	.3	3	2.0	10	2.0
4	88	.5	5	3.0	15	5.0
5	80	1.0	10	4.0	25	10.0
Sample grade	Sample grade barley shall be barley of the class Western Barley which does not come within the grade requirements of any of the grades from No. 1 to No. 5, inclusive, or which contains more than 15 percent moisture; or which contains inseparable adobe, stones, and cinders, singly or combined; or which is musty, or sour, or heating, or hot; or which contains more than 5 percent of barley damaged or materially discolored by blight and/or mold; or which has any commercially objectionable foreign odor except of smut or garlic, or which contains a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which contains wild brome grasses of a character and in a quantity sufficient to render the grain of low quality for feeding purposes; or which is otherwise of distinctly low quality.					

NOTE.—See also special grades for Dockage, Test weight of Western Barley, and for 2-rowed, Tough, Bright, Stained, Blighted, Smutty, Garlicky, Weevily, Ergoty, and Bleached barley, and for Unnatural Material.

MIXED BARLEY (CLASS IV)

Mixed Barley.—Mixed Barley shall be any mixture of barley not provided for in the Classes I to III, inclusive.

Grades for Mixed Barley.—Mixed Barley shall be graded according to the grade requirements of either (1) the class Barley, or (2) the class Black Barley, or (3) the class Western Barley, according to which class of barley predominates in the mixture, except that all of the grade specifications in any class as to the maximum percentages of black barley shall be disregarded.

The grade designation for Mixed Barley shall include successively, in the order named, the number of the grade or the words "Sample grade", as the case may be; the words "Mixed Barley"; followed by the name and approximate percentage of each class of barley which constitutes 10 percent or more of the mixture in the order of its predominance; but if only one class exceeds 10 percent of the mixture, the name and approximate percentage of that class shall be included in the grade designation, followed by the name and approximate percentage of at least one other class. For Mixed Barley, in which barley of the class Western Barley predominates, the grade designation shall include a statement of the test weight per bushel.

SPECIAL GRADES FOR BARLEY

Special grades shall be grades other than the unqualified numerical grades 1 to 5, inclusive, and Sample grade, and shall be added to, and made a part of, such grades, when applicable.

DOCKAGE [21]

Dockage includes weed seeds, weed stems, chaff, straw, grain other than barley, sand, dirt, and any material other than barley which can be removed readily from the barley by the use of such appropriate sieves and cleaning devices as are approved by the Secretary of Agriculture; also undeveloped, shriveled, and small pieces of barley kernels removed in properly separating the foreign material and which cannot be recovered by properly rescreening or recleaning. The quantity of dockage shall be calculated in terms of percentage based on the total weight of the grain including the dockage. The percentage of dockage, so calculated, when equal to 1 percent or more, shall be stated in terms of whole percent, and when less than 1 percent shall not be stated. A fraction of a percent shall be disregarded. The word "Dockage", together with the percentage thereof, shall be added to, and made a part of, the grade designation.

TEST WEIGHT OF WESTERN BARLEY

Grades for Test weight of Western Barley.—For barley of the class Western Barley, the test weight per bushel in terms of whole pounds shall be added to, and made a part of, the grade designation, following the name of the class. A fraction of a pound shall be disregarded.

TWO-ROWED BARLEY

Two-rowed Barley shall consist of 2-rowed barley of the class Barley, or the class Western Barley, and may contain not more than 10 percent of barley of other varieties.

Grades for 2-rowed barley.—Two-rowed barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not 2-rowed, and there shall be added to, and made a part of, the grade designation, preceding the name of the class, the word "Two-rowed".

TOUGH BARLEY

Tough barley shall be (*a*) barley of either of the classes Barley or Black Barley, or of the class Mixed Barley in which barley of either one of the classes Barley or Black Barley predominates, which contains more than 14.5 percent but not more than 16 percent of moisture, and (*b*) barley of the class Western Barley, or of the class Mixed Barley in which barley of the class Western Barley predominates, which contains more than 13.5 percent but not more than 15 percent of moisture.

Grades for Tough barley.—Tough barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not tough, and there shall be added to, and made a part of, the grade designation, the word "Tough".

[21] Sieves to be used in the determination of dockage in barley shall be a metal sieve perforated with triangular perforations eight sixty-fourths of an inch long on each side of the perforations, and the Cox indented sieve for all samples containing bur-clover pods.

Bright Barley

Bright barley shall be all barley, except Bleached barley, that is of good natural color.

Grades for Bright barley.—Bright barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not bright, and there shall be added to, and made a part of, the grade designation, preceding the name of the class, the word "Bright".

Stained Barley

Stained barley shall be all barley, except Bleached barley, that is badly stained,[22] or weathered.

Grades for Stained barley.—Stained barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not stained, and there shall be added to, and made a part of, the grade designation, the word "Stained".

Blighted Barley [23]

Blighted barley shall be all barley which contains more than 2 percent but not more than 5 percent of barley damaged or materially discolored by blight and/or mold.

Grades for Blighted barley.—Blighted barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not blighted, and there shall be added to, and made a part of, the grade designation, the word "Blighted".

Smutty Barley

Smutty barley shall be barley which has the kernels covered with smut spores, or which contains smut masses in a quantity in excess of 0.2 percent.

Grades for Smutty barley.—Smutty barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not smutty, and there shall be added to, and made a part of, the grade designation, the word "Smutty".

Garlicky Barley

Garlicky barley shall be barley which contains garlic or wild onion bulblets in excess of a quantity equal to three newly harvested bulblets of average size in 500 grams of barley.[24]

Grades for Garlicky barley.—Garlicky barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not garlicky, and there shall be added to, and made a part of, the grade designation, the word "Garlicky".

Weevily Barley

Weevily barley shall be barley which is infested with live weevils or other insects injurious to stored grain.

Grades for Weevily barley.—Weevily barley shall be graded and designated to the grade requirements of the standards applicable

[22] Barley of the unqualified numerical grades and Sample grade may be slightly stained, stained, or slightly weathered, according to the interpretations made of these terms in the present official standards.
[23] This grade was made effective July 21, 1933.
[24] Dry bulblet interpretation—see Garlicky wheat.

to such barley if it were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily".

Ergoty Barley

Ergoty barley shall be barley which contains ergot in excess of 0.3 percent.

Grades for Ergoty barley.—Ergoty barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not ergoty, and there shall be added to, and made a part of, the grade designation, the word "Ergoty".

Bleached Barley

Bleached barley shall be barley which, in whole or in part, has been treated by the use of sulphurous acid or other bleaching chemical.

Grades for Bleached barley.—Bleached barley shall be graded and designated according to the grade requirements of the standards applicable to such barley if it were not bleached, and there shall be added to, and made a part of, the grade designation, the word "Bleached".

Unnatural Material

Unnatural Material shall be kernels and pieces of kernels of corn, grain sorghums, nongrain sorghums, and soybeans, and other matter except barley not grown naturally with barley. Unnatural material shall not include sand, dirt, stones, and cinders.

Grades for Unnatural Material.—Barley which, before the removal of dockage, contains unnatural material in excess of 0.5 percent, shall be graded and designated according to the grade requirements applicable to such barley if it did not contain unnatural material, and there shall be added to, and made a part of, the grade designation, preceding the statement of dockage, if any, the words "Unnatural Material".[25]

DEFINITIONS

Basis of determinations.—Each determination of dockage, unnatural material, moisture, temperature, odor, garlic, and live weevils or other insects injurious to stored grain, shall be upon the basis of the grain including dockage. All other determinations shall be upon the basis of the grain when free from dockage.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture in barley shall be ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel, as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent

[25] See proposed certification regulations for barley which would require licensed inspectors to embody under remarks in all certificates issued by them for barley, except those issued for export shipments, a statement of the words "Unnatural Material" and the kind or kinds, together with a percentage statement of the total quantity thereof.

results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall be all matter other than barley, except other grains, wild oats, and smut masses, which is not separated from the barley in the proper determination of dockage.[26]

Other grains.—Other grains shall include wheat, rye, oats, corn, grain sorghums, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Sound barley.—Sound barley shall be kernels and pieces of kernels of barley remaining after the removal of dockage, which are not damaged or materially discolored by blight and/or mold, which are not heat damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of barley, other grains, and wild oats, which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks, in all certificates issued by them for barley, unless issued for an export shipment, a statement of:

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis;

(*b*) *Test weight.*—The test weight per bushel for barley of the classes Barley and Black Barley, in terms of whole and half pounds;

(*c*) *Moisture content.*—The percentage of moisture, for every lot which is graded Tough, or Sample grade on account of moisture;

(*d*) *Unnatural Material.*—The words "Unnatural Material" followed by the name of the kind or kinds and by a percentage statement of the total quantity thereof, for all lots of barley graded under the provisions of the special grade Unnatural Material.

PROPOSED CORN STANDARDS [27]

(Not official standards)

For the purpose of the proposed grain standards of the United States for corn (maize):

Corn.—Corn shall be any grain which consists of 50 percent or more of shelled corn of the dent or flint varieties, and may contain not more than 10 percent of other grains for which standards have been established under the provisions of the Grain Standards Act.

Classes.—Corn shall be divided into three classes, as follows: Class I, Yellow Corn; Class II, White Corn; and Class III, Mixed Corn.

YELLOW CORN (CLASS I)

This class shall include yellow corn, and may include not more than 5 percent of corn of other colors. A slight tinge of red on kernels

[26] That portion of the unnatural material which is not separated as dockage functions as a part of the total unnatural material, as well as against the percentage of sound barley.

[27] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

of corn otherwise yellow shall not affect their classification as yellow corn.

WHITE CORN (CLASS II)

This class shall include White corn, and may include not more than 2 percent of corn of other colors. A slight tinge of light straw color or of pink on kernels of corn otherwise white shall not affect their classification as white corn.

MIXED CORN (CLASS III)

This class shall consist of corn of various colors that does not meet the color requirements for the classes Yellow Corn and White Corn. White-capped yellow kernels shall be classified as Mixed Corn.

Grades.—Corn shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade of the class to which it belongs, and according to the special grades when applicable.

Corn

Grade requirements for Yellow Corn, White Corn, and Mixed Corn

Grade No.	Minimum test weight per bushel	Maximum limits of—			
		Moisture	Cracked corn and foreign material	Damaged kernels (corn and other grains)	
				Total	Heat-damaged
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*
1	54	14	2	3	0.1
2	53	16	3	5	.2
3	51	18	4	8	.5
4	48	20	5	12	1.0
5	44	23	7	16	3.0
Sample grade	Sample grade corn shall be corn of the class Yellow Corn or White Corn, or Mixed Corn, which does not come within requirements of any of the grades from No. 1 to No. 5, inclusive, or which contains stones and/or cinders; or which is musty, or sour, or heating, or hot; or which has any commercially objectionable foreign odor; or which is otherwise of distinctly low quality.				

NOTE.—See also special grades for Flint, and Weevily corn, and for Unnatural Material.

SPECIAL GRADES FOR CORN

Special grades shall be grades other than the unqualified numerical grades 1 to 5, inclusive, and Sample grade, and shall be added to, and made a part of, such grades, when applicable.

FLINT CORN

Flint corn shall include all varieties of flint corn of any class, and may include not more than 50 percent of other corn.

Grades for Flint corn.—Flint corn shall be graded and designated according to the grade requirements of the standards applicable to such corn if it were not flint corn, and there shall be added to, and made a part of, the grade designation, immediately following the class name, the word "Flint".

Weevily Corn

Weevily corn shall be corn that is infested with live weevils or other insects injurious to stored grain.

Grades for Weevily corn.—Weevily corn shall be graded and designated according to the grade requirements of the standards applicable to such corn if it were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily".

Unnatural Material

Unnatural Material shall be kernels and pieces of kernels of wheat, rye, barley, oats, grain sorghums, nongrain sorghums, and soybeans, and other matter except corn not grown naturally with corn. Unnatural material shall not include sand, dirt, stones, and cinders.

Grades for Unnatural Material.—Corn which contains unnatural material in excess of 0.5 percent, shall be graded and designated according to the grade requirements applicable to such corn if it did not contain unnatural material, and there shall be added to, and made a part of, the grade designation, the words "Unnatural Material".[28]

DEFINITIONS

Basis of determinations.—Each determination of class and variety shall be upon the basis of the grain after the removal of that portion of the cracked corn and foreign material which will pass through a No. 10 sieve. All other determinations shall be upon the basis of the grain including cracked corn and foreign material.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture in corn shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Cracked corn and foreign material.—Cracked corn and foreign material shall be kernels and pieces of kernels of corn and all matter other than corn which will pass through a No. 10 sieve, and all matter other than corn remaining on such sieve after screening.[29]

No. 10 sieve.—A metal sieve perforated with round holes $^{1}\!/_{4}$ inch in diameter.

Other grains.—Other grains shall include wheat, rye, oats, grain sorghums, barley, hull-less barley, emmer, spelt, einkorn, Polish

[28] See proposed certification regulations for corn which would require licensed inspectors to embody under remarks in all certificates issued by them for corn, except those issued for export shipments, a statement of the words "Unnatural Material" and the kind or kinds together with a percentage statement of the total quantity thereof.

[29] That portion of the unnatural material which is separated with the cracked corn and foreign material, functions as "cracked corn and foreign material", as well as a part of the total "Unnatural Material".

wheat, poulard wheat, cultivated buckwheat, sweet corn, and pop corn.

Damaged kernels.—Damaged kernels shall be kernels and pieces of kernels of corn and other grains which are heat damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of corn and other grains which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under remarks, in all certificates issued by them for corn, unless issued for an export shipment, a statement of;

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis:

(*b*) *Test weight per bushel.*—The test weight per bushel, in terms of whole and half pounds;

(*c*) *Moisture content.*—The percentage of moisture;

(*d*) *Unnatural Material.*—The words "Unnatural Material" followed by the name of the kind or kinds and by a percentage statement of the total quantity thereof, for all lots of corn graded under the provisions of the special grade Unnatural Material.

PROPOSED GRAIN SORGHUMS STANDARDS

(Not official standards)

For the purpose of the proposed grain standards of the United States for grain sorghums:

Grain sorghums.—Grain sorghums shall be any grain, which before the removal of dockage, consists of 50 percent or more of grain sorghums and may contain not more than 25 percent nongrain sorghums, and not more than 10 percent of other grains for which standards have been established under the provisions of the Grain Standards Act.

PLAN A[30]—CLASS DEFINITIONS BASED PARTLY ON TYPE AND PARTLY ON COLOR

Classes.—Grain sorghums shall be divided into five classes, as follows: Class I, Kafir; Class II, Milo; Class III, White Grain Sorghums; Class IV, Brown Grain Sorghums; and Class V, Mixed Grain Sorghums.

Grades.—Grain sorghums shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade of the class and subclass to which they belong, and according to the special grades when applicable.

[30] Two plans for the classification of grain sorghums, Plan A and Plan B, are presented in these proposed standards for public consideration. See p. 37 for Plan B.

Kafir (Class I)

This class shall include all varieties of kafir and hegari, except Schrock kafir, and may include not more than 10 percent of grain sorghums of other classes. This class shall be divided into three subclasses as follows:

White Kafir.—This subclass shall include all kafir and hegari having white kernels, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors. Colored spots upon kernels otherwise white shall not affect their classification as White kafir.

Red Kafir.—This subclass shall include all kafir having red kernels, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors.

Kafir.—This subclass shall include all kafir and hegari not coming within the classifications for White Kafir and Red Kafir.

Milo (Class II)

This class shall include all varieties of milo, and may include not more than 10 percent of grain sorghums of other classes. This class shall be divided into two subclasses as follows:

Yellow Milo.—This subclass shall include milo of the yellow milo type, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors.

Milo.—This subclass shall include all milo not coming within the classification of Yellow Milo, and shall include Wheatland milo.

White Grain Sorghums (Class III)

This class shall include all types of grain sorghums having white kernels, including white durra, feterita, shallu, Freed sorgo, and Chiltex, but shall not include white kafir, hegari, and white milo, and may include not more than 10 percent of grain sorghums of other classes. Colored spots upon kernels otherwise white shall not affect their classification as white. This class shall be divided into two subclasses as follows:

White Durra.—This subclass shall include all grain sorghums of the white durra type, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors.

White.—This subclass shall include all grain sorghums of the class White not coming within the classification of White Durra.

Brown Grain Sorghums (Class IV)

This class shall include all types of grain sorghums having brown kernels, including darso, brown kaoliang, Schrock kafir, brown durra, and Grohoma, and may include not more than 10 percent of grain sorghums of other classes.

Note.—Any grain sorghum or grain-sorghum hybrid not mentioned in Classes I to IV, inclusive, shall be included in the class which it most nearly resembles.

Mixed Grain Sorghums (Class V)

Mixed Grain Sorghums shall include all mixtures of grain sorghums not provided for in the Classes I to IV, inclusive.

Grades for Mixed Grain Sorghums.—The grade designation of "Mixed Grain Sorghums" shall include, successively, in the order named: (1) The number of the grade or the words "Sample grade", as the case may be; (2) the words "Mixed Grain Sorghums"; and (3) the name and approximate percentage of each class of grain sorghums which constitutes 10 percent or more of the mixtures, in the order of its predominance, but if only one class exceeds 10 percent of the mixture, the name and approximate percentage of that class shall be included in the grade designation, followed by the name and approximate percentage of at least one other class. In the case of Mixed Grain Sorghums consisting of 90 percent or more white kafir and other white grain sorghums combined, and which consist of 70 percent or more white kafir, the name of the subclass White Kafir shall be substituted in the grade designation for the class name Kafir.

PLAN B—CLASS DEFINITIONS BASED ON COLOR ONLY

Classes.—Grain sorghums shall be divided into five classes as follows: Class I, White; Class II, Yellow; Class III, Red; Class IV, Brown; and Class V, Mixed Grain Sorghums.

Grades.—Grain sorghums shall be graded and designated according to the respective grade requirements of the numerical grades and Sample grade of the class and subclass to which they belong, and according to the special grades when applicable.

White (Class I)

This class shall include all varieties of grain sorghums having white kernels and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors. Colored spots upon kernels otherwise white shall not affect their classification as white. This class shall be divided into three subclasses as follows:

SUBCLASS (A) WHITE KAFIR

This subclass shall include grain sorghums of the white kafir type, including hegari, and may include not more than 10 percent of other grain sorghums.

SUBCLASS (B) WHITE DURRA

This subclass shall include grain sorghums of the white durra type, and may include not more than 10 percent of other grain sorghums.

SUBCLASS (C) WHITE

This subclass shall include all grain sorghums of the class White not coming within the classification for subclass (*a*) White Kafir, or subclass (*b*) White Durra.

Yellow (Class II)

This class shall include all varieties of grain sorghums having yellow or buff kernels, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors. This class shall be divided into two subclasses as follows:

SUBCLASS (A) YELLOW MILO

This subclass shall include grain sorghums of the yellow milo type, and may include not more than 10 percent of other grain sorghums.

SUBCLASS (B) YELLOW

This subclass shall include all grain sorghums of the class Yellow not coming within the classification for subclass (*a*) Yellow Milo, and shall include Wheatland milo.

RED (CLASS III)

This class shall include all varieties of grain sorghums having red kernels, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors. This class shall be divided into two subclasses as follows:

SUBCLASS (A) RED KAFIR

This subclass shall include grain sorghums of the red kafir type and may include not more than 10 percent of other grain sorghums.

SUBCLASS (B) RED

This subclass shall include all grain sorghums of the class Red not coming within the classification for subclass (*a*) Red Kafir.

BROWN (CLASS IV)

This class shall include all varieties of grain sorghums having brown kernels, and may include not more than 10 percent of grain sorghums and/or nongrain sorghums of other colors.

MIXED GRAIN SORGHUMS (CLASS V)

Mixed Grain Sorghums shall include all mixtures of grain sorghums not provided for in the classes I to IV, inclusive.

Grades for Mixed Grain Sorghums.—The grade designation of Mixed Grain Sorghums shall include, successively, in the order named: (1) The number of the grade or the words "Sample grade", as the case may be; (2) the words "Mixed Grain Sorghums"; (3) the name and approximate percentage of each class of grain sorghums which constitute 10 percent or more of the mixture, in the order of its predominance, but if only one class exceeds 10 percent of the mixture, the name and approximate percentage of that class shall be included in the grade designation, followed by the name and approximate percentage of at least one other class. In those cases where Mixed Grain Sorghums consist of 70 percent or more of grain sorghums of the types white kafir, white durra, yellow milo, or red kafir, singly or combined, and not more than 10 percent of brown grain sorghums, the name of the subclass or subclasses designating such type or types, as the case may be, shall be substituted in the grade designation for the class names.

Grain Sorghums

[Grade requirements for the subclasses specified in either Plan A or Plan B]

Grade No.	Minimum test weight per bushel	Maximum limits of—				
		Moisture	Damaged kernels (grain sorghums, nongrain sorghums, and other grains)		Nongrain sorghums	Cracked kernels and foreign material
			Total	Heat-damaged		
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	55	14	2	0.2	1	4
2	53	15	5	.5	3	8
3	51	16	10	1.0	5	12
4	49	18	15	3.0	10	15
Sample grade	Sample grade grain sorghums shall be grain sorghums as specified either in Plan A or plan B which do not come within the requirements of any of the grades from No. 1 to No. 4, inclusive; or which contain inseparable stones and/or cinders; or which are musty, or sour, or heating, or hot; or which are badly weatherd; or which have any commercially objectionable foreign odor except of smut; or which are otherwise of distinctly low quality.					

NOTE.—See also, special grades for Dockage, and for Bright, Stained, Weevily, and Smutty grain sorghums, and for Unnatural Material.

SPECIAL GRADES FOR GRAIN SORGHUMS

Special grades shall be grades other than the unqualified numerical grades 1 to 4, inclusive, and Sample grade, and shall be added to, and made a part of, such grades, when applicable.

DOCKAGE

Dockage includes sand, dirt, finely broken kernels, weed seeds, and other foreign material which can be removed readily from the grain sorghums by means of a metal sieve perforated with round holes two and one half sixty-fourths of an inch in diameter. The quantity of dockage shall be calculated in terms of percentage based on the total weight of the grain including the dockage.

Dockage shall be stated in terms of half percent, whole percent, or whole and half percent, as the case may be, and a fraction of any half percent shall be disregarded. The word "Dockage", together with the percentage thereof, shall be added to, and made a part of, the grade designation.

BRIGHT GRAIN SORGHUMS

Bright grain sorghums shall be grain sorghums of any class or subclass which have good, natural color.

Grades for Bright grain sorghums.—Bright grain sorghums shall be graded and designated according to the grade requirements of the standards applicable to such grain sorghums if they were not bright, and there shall be added to, and made a part of, the grade designation, preceding the name of the class or subclass, the word "Bright".

Stained Grain Sorghums

Stained grain sorghums shall be grain sorghums of any class or subclass which are stained or discolored,[31] but which are not badly weathered.[32]

Grades for Stained grain sorghums.—Stained grain sorghums shall be graded and designated according to the grade requirements of the standards applicable to such grain sorghums if they were not stained, and there shall be added to, and made a part of, the grade designation, the word "Stained."

Weevily Grain Sorghums

Weevily grain sorghums shall be grain sorghums which are infested with live weevils or other insects injurious to stored grain.

Grades for Weevily grain sorghums.—Weevily grain sorghums shall be graded and designated according to the grade requirements of the standards applicable to such grain sorghums if they were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily."

Smutty Grain Sorghums

Smutty grain sorghums shall be grain sorghums which have the kernels covered with smut spores, or which contain a distinct quantity of smut spores.

Grades for Smutty grain sorghums.—Smutty grain sorghums shall be graded and designated according to the grade requirements of the standards applicable to such grain sorghums if they were not smutty, and there shall be added to, and made a part of, the grade designation, the word "Smutty."

Unnatural Material

Unnatural Material shall be kernels and pieces of kernels of wheat, rye, oats, corn, barley, and soybeans, and other matter except grain sorghums not grown naturally with grain sorghums. Unnatural material shall not include sand, dirt, stones, and cinders.

Grades for Unnatural Material.—Grain sorghums which, before the removal of dockage, contain unnatural material in excess of 0.5 percent, shall be graded and designated according to the grade requirements applicable to such grain sorghums if they did not contain unnatural material, and there shall be added to, and made a part of, the grade designation, preceding the statement of dockage, if any, the words "Unnatural Material." [33]

DEFINITIONS

Basis of determinations.—Each determination of dockage, unnatural materials, moisture, temperature, odor, and live weevils or other insects injurious to stored grain, shall be upon the basis of the lot of

[31] Grain sorghums of the unqualified numerical grades and Sample grade may be slightly stained or slightly discolored.

[32] Grain sorghums that are badly weathered are graded Sample grade, account badly weathered.

[33] See proposed certification regulations for grain sorghums which would require licensed inspectors to embody under Remarks in all certificates issued by them for grain sorghums, except those issued for export shipments, a statement of the words "Unnatural Material" and the kind or kinds together with a percentage statement of the total quantity thereof.

grain as a whole, including dockage and cracked kernels and foreign material. All other determinations shall be upon the basis of the grain when free from dockage.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture in grain sorghums shall be that ascertained by the moisture tester and the method of use thereof described in Department Bulletin No. 1375, issued by the United States Department of Agriculture, or that ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Other grains.—Other grains shall include wheat, rye, oats, corn, barley, hull-less barley, emmer, spelt, einkorn, Polish wheat, poulard wheat, and cultivated buckwheat.

Nongrain sorghums.—Nongrain sorghums shall include broomcorn, Sudan grass, Johnson grass, nongrain-sorghum hybrids, and sorgo (commonly called "cane seed"). The varieties Atlas sorgo and Freed sorgo shall not be included in nongrain sorghums.

Cracked kernels and foreign material.—Cracked kernels and foreign material shall be: Kernels and pieces of kernels of grain sorghums, and all other matter, which, after the removal of dockage, will pass through a No. 8 sieve; also other grains and all other matter except grain sorghums and nongrain sorghums remaining on such sieve after screening.

No. 8 sieve.—A metal sieve perforated with triangular perforations eight sixty-fourths of an inch long on each side.

Damaged kernels.—Damaged kernels shall be kernels and pieces of kernels of grain sorghums, nongrain sorghums, and other grains which are heat damaged, sprouted, frosted, badly ground damaged, moldy, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of grain sorghums, nongrain sorghums, and other grains which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks, in all certificates issued by them for grain sorghums, unless issued for an export shipment, a statement of:

(*a*) *Grade factors.*—The factor or factors which determined the grade, except in the case of grade No. 1 to which may be added any other factor, or the complete analysis;

(*b*) *Test weight per bushel.*—The test weight per bushel, in terms of whole and half pounds;

(*c*) *Moisture content.*—The percentage of moisture for those lots which are graded lower than No. 2 on any factor;

(*d*) *Unnatural Material.*—The words "Unnatural Material" followed by the name of the kind or kinds, together with a percentage statement of the total quantity thereof, for all lots of grain sorghums graded under the provisions of the special grade Unnatural Material.

PROPOSED MIXED GRAIN STANDARDS [34]

(Not official standards)

For the purpose of the proposed grain standards of the United States for mixed grain:

Mixed Grain (*Definition*).—Mixed Grain shall be any mixture of those kinds of grain for which standards are in effect under the provisions of the Grain Standards Act, that does not come within the requirements of any of the standards for such grains, and that does not contain more than 50 percent of foreign material including wild oats.

Grades for Mixed Grain.—Mixed Grain shall be graded and designated either as "Mixed Grain" or as "Sample grade Mixed Grain", and according to the special grades for Tough, Smutty, Ergoty, Garlicky, Weevily, Scabby, and Treated Mixed Grain, when applicable.

Mixed Grain (*Grade*).—Mixed Grain which does not come within the specifications for Sample grade Mixed Grain shall be graded as Mixed Grain.

Sample grade Mixed Grain.—Mixed Grain which contains more than 16 percent of moisture or 15 percent of damaged kernels, or 3 percent of heat-damaged kernels; or which is musty, or sour, or heating, or hot; or which contains more than 5 percent of barley damaged or materially discolored by blight and/or mold; or which contains stones and/or cinders; or which has any commercially objectionable foreign odor, except of smut or garlic; or which has a quantity of smut so great that any one or more of the grade requirements cannot be applied accurately; or which is otherwise of distinctly low quality; shall be graded as Sample grade Mixed Grain.

Grade designation for Mixed Grain.—The grade designation for Mixed Grain shall include, successively, in the order named, (1) the words "Mixed Grain", or the words "Sample grade Mixed Grain", as the case may be; (2) the name and approximate percentage of each kind of grain which constitutes more than 10 percent of the mixture in the order of its predominance, but if only one kind exceeds 10 percent of the mixture, the name and approximate percentage of that kind shall be included in the grade designation, followed by the name and approximate percentage of at least one other kind; and (3) the words "Foreign material", together with the percentage thereof, in terms of whole percent—fractions of a whole percent shall be disregarded.

SPECIAL GRADES FOR MIXED GRAIN

Special grades shall be grades other than the unqualified grades Mixed Grain and Sample grade Mixed Grain, and shall be added to and made a part of such grades when applicable.

[34] The specifications of these standards shall not excuse failure to comply with the provisions of the Food and Drugs Act.

Tough Mixed Grain

Tough Mixed Grain shall be mixed grain which contains more than 14.5 percent but not more than 16 percent of moisture.

Grades for Tough Mixed Grain.—Tough Mixed Grain shall be graded and designated according to the grade requirements of the standards applicable to such mixed grain if it were not tough, and there shall be added to, and made a part of, the grade designation, the word "Tough".

Smutty Mixed Grain

Smutty Mixed Grain shall be (*a*) mixed grain in which wheat or rye predominates, and which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 15 balls of average size in 250 grams of mixed grain, (*b*) mixed grain in which oats predominates, and which contains balls, portions of balls, or spores, of smut, in a quantity in excess of 30 balls of average size in 250 grams of mixed grain, or (*c*) any mixed grain which has the kernels covered with smut spores, or which contains smut masses in excess of a quantity equal to 0.2 percent.

Grades for Smutty Mixed Grain.—Smutty Mixed Grain shall be graded and designated according to the grade requirements of the standards applicable to such mixed grain if it were not smutty, and there shall be added to, and made a part of, the grade designation, the word "Smutty".

Ergoty Mixed Grain

Ergoty Mixed Grain shall be mixed grain which contains ergot in excess of 0.3 percent.

Grades for Ergoty Mixed Grain.—Ergoty Mixed Grain shall be graded and designated according to the grade requirements of the standards applicable to such mixed grain if it were not ergoty, and there shall be added to, and made a part of, the grade designation, the word "Ergoty".

Garlicky Mixed Grain

Garlicky Mixed Grain shall be (*a*) mixed grain in which wheat or rye predominates, and which has an unmistakable odor of garlic or wild onions, or which contains garlic or wild onion bulblets in excess of a quantity equal to one newly harvested bulblet of average size in 1,000 grams of mixed grain; or (*b*) mixed grain in which oats or barley predominates, and which contains garlic or wild onion bulblets in excess of a quantity equal to three newly harvested bulblets of average size in 500 grams of mixed grain.[35]

Grades for Garlicky Mixed Grain.—Garlicky Mixed Grain shall be graded and designated according to the grade requirements of the standards applicable to such mixed grain if it were not garlicky, and there shall be added to, and made a part of, the grade designation, the word "Garlicky".

Weevily Mixed Grain

Weevily Mixed Grain shall be mixed grain which is infested with live weevils or other insects injurious to stored grain.

Grades for Weevily Mixed Grain.—Weevily Mixed Grain shall be graded and designated according to the grade requirements of the

[35] Dry bulblet interpretation—see Garlicky wheat.

standards applicable to such mixed grain if it were not weevily, and there shall be added to, and made a part of, the grade designation, the word "Weevily".

Blighted Mixed Grain

Blighted Mixed Grain shall be all mixed grain in which barley predominates, and which, as a whole, contains more than 2 percent but not more than 5 percent of barley damaged or materially discolored by blight and/or mold.

Grades for Blighted Mixed Grain.—Blighted Mixed Grain shall be graded and designated according to the grade requirements of the standards applicable to such mixed grain if it were not blighted, and there shall be added to, and made a part of, the grade designation, the word "Blighted."

Treated Mixed Grain

Treated Mixed Grain shall be mixed grain which has been scoured, limed, washed, sulphured, or treated in such a manner that its true quality is not reflected by either the numerical grade or Sample grade designation, alone.

Grades for Treated Mixed Grain.—Treated Mixed Grain shall be graded and designated according to the grade requirements of the standards applicable to such mixed grain if it were not treated, and there shall be added to, and made a part of, the grade designation, a statement indicating the kind of treatment.

DEFINITIONS

Basis of determination.—Each determination of test weight per bushel, damage, heat damage, smut, ergot, and blighted, shall be on the basis of the grain when free from foreign material, and all other determinations shall be on the basis of the grain including foreign material.

Percentages.—Percentages, except in the case of moisture, shall be percentages ascertained by weight.

Percentage of moisture.—Percentage of moisture shall be that ascertained by the moisture tester and method of use thereof described in Department Bulletin 1375, issued by the United States Department of Agriculture, except that the heating element shall be cut off when the thermometer shows a temperature specified for the grain which predominates in the mixture, or that ascertained by any device and method which give equivalent results in the determination of moisture, and which have been approved by the Secretary of Agriculture.

Test weight per bushel.—Test weight per bushel shall be the weight per Winchester bushel as determined by the testing apparatus and the method of use thereof described in Bulletin No. 1065, dated May 18, 1922, issued by the United States Department of Agriculture, or as determined by any device and method which give equivalent results in the determination of test weight, and which have been approved by the Secretary of Agriculture.

Foreign material.—Foreign material shall be all matter other than grains for which standards have been established under the provisions of the Grain Standards Act, and shall include wild oats; also undeveloped, shriveled, and small pieces of grain kernels which are removed

from the grain in properly separating the foreign material by means of such appropriate sieves and cleaning devices as are approved by the Secretary of Agriculture.

Damaged kernels.—Damaged kernels shall be all kernels and pieces of kernels of wheat, corn, oats, barley, rye, and grain sorghums, which are heat damaged, sprouted, frosted, badly ground damaged, badly weather damaged, or otherwise distinctly damaged.

Heat-damaged kernels.—Heat-damaged kernels shall be kernels and pieces of kernels of wheat, corn, oats, barley, rye, and grain sorghums, which have been distinctly discolored or damaged by external heat or as a result of heating caused by fermentation.

PROPOSED REGULATIONS FOR CERTIFYING STATEMENTS UNDER REMARKS

These proposed regulations are not a part of the proposed grain standards, although they pertain to inspection procedure.

Under regulations pursuant to the United States Grain Standards Act, licensed inspectors are required to embody under Remarks:

(1) In every certificate issued by them for Mixed Grain, a statement of:

(*a*) *Test weight per bushel.*—The test weight per bushel, in terms of whole and half pounds; and

(2) In all certificates issued by them for Mixed Grain, except those issued for export shipments, a statement of:

(*a*) *Sample grade factors.*—Every factor which determines the grade for those lots which are graded Sample grade;

(*b*) *Moisture content.*—The percentage of moisture for every lot which is graded Tough, or Sample grade account of moisture;

(*c*) *Total damage.*—The percentage of total damaged kernels for those lots which contain more than 7 percent of damaged kernels;

(*d*) *Heat-damaged kernels.*—The percentage of heat-damaged kernels for those lots which contain more than 0.5 percent heat-damaged kernels;

(*e*) *Class names.*—The name of the class of wheat (i.e., Hard Red Spring, Hard Red Winter, or Durum, etc.) other than Mixed Wheat, when the mixture consists of 75 percent or more of wheat.

EXPLANATION OF PROPOSED GRAIN STANDARDS

OBJECTIVES IN REVISION OF GRAIN STANDARDS

The Bureau, in its formulation of the proposed standards submitted with this report, has endeavored to avoid extreme policies that would disturb materially existing commercial practices, that would be difficult of administration, that would involve any material slowing down of inspection procedure, or that would cause any decrease in the intermarket uniformity of inspection. Neither a policy of extensive simplification of the present official grain standards nor a policy of extensive expansion in the number of classes, subclasses, and grades, would fully meet the requirements of the grain industry.

The Bureau has adopted a basis of revision that retains largely the structure of the present official standards, with which the grain industry is familiar, that should improve the standards in a practical manner for commercial usage, that includes the most constructive

suggestions for revision made by the grain industry, and that would attain the following principal objectives:

(1) Distribute the receipts of country-run grain among the various grades in such a manner as to provide, in most years, a sufficient volume for practical trading purposes in each of the chief commercial grades.

A study of Federal grain-supervision data covering market receipts for a period of years indicates that in several cases the present official grade requirements are such as to cause an entirely disproportionate share of the receipts to fall into one or the other of the numerical grades.

(2) Correlate the grades with the most important requirements of grain users and with trade practices, in so far as it is practical in inspection procedure to do so.

(3) Differentiate and indicate, by means of special grades in the standards, and by notations on certificates governed by regulation, a limited number of the most important individual factors of quality within the numerical grades that are known to have an important influence on the price of grain, especially country-run grain.

(4) Improve the important contract grades, especially No. 2 and No. 3, so that they will represent better quality than they now represent.[36] In case of wheat, this objective includes the formulating of three commercial grades, each of which would represent relative quality suitable for direct mill usage, in so far as this may be done under the general structure of the present official standards.

(5) Curtail objectionable and uneconomic mixing operations for the benefit of the entire grain industry, yet to impose no restrictions on the necessary conditioning and mixing of small lots of grain of diverse grade and condition into large, composite lots of uniform grade and condition.

(6) Provide the grain industry with as many definite grade designations representing important consumers' requirements as are possible within the limitations of practical inspection procedure, for the purpose of establishing as many definite market values and quotations by grade as are practical, thus to increase the usefulness of the grades and grain market news services.

TRADE PRACTICE TREND IS TOWARD COMPLEXITY

The Bureau's studies have shown that a sentiment exists in some quarters of the grain industry for revisions that would make certain additions to the subclasses and grades so that they would designate grain-users' requirements more specifically than do the present official subclasses and grades, whereas in other quarters sentiment favors a material simplification of the standards by a reduction in the number of classes, subclasses, and grades. In some quarters popular sentiment on these subjects expresses a generalized demand for simplification of the standards but at the same time expresses numerous specific demands for more particularized methods of grain grading. Therefore, the problem of whether a policy of grain standard's revision should be adopted that would tend to simplify the standards by a

[36] Wherever, in this report, the expression "grade No. 1", or "grade No. 2", or "grade No. 3", etc., appears, it refers to a numerical grade designation unqualified by any special designation such as "Smutty" or "Tough". Hereafter such unqualified grades are referred to as straight grades, or numerical grades, or unqualified numerical grades. Under the present official standards, the currently used "contract grades" are numerical grades unqualified by the inclusion of any special grade in the grade designation.

reduction in the number of grades, or a policy that would tend to increase the number of grades, should be given consideration.

During the last 15 years the trend in grain production, handling, testing, merchandising, and processing, has been definitely toward complexity rather than toward simplicity. The kinds, varieties, and diseases of grain tend to increase, and the kinds of farm equipment and methods of production, which may influence grain quality, tend to increase or change. Trade practices also have tended and are tending definitely toward complexity to meet the modern, relatively specialized requirements of millers and other processors, and other grain users. To a considerable extent the growing complexity of trade practices is caused by the increase in modern factory baking and in the specialization and standardization of manufactured foods and feeds. Modern grain-manufacturing industries are much more particular in their grain requirements than were the grain-manufacturing industries of the previous generations. Thus trade practices have steadily become more complex to meet users' requirements.

Minimum Quality Only Guaranteed by Grades

The grade designations of the official grain standards serve to guarantee the buyer a quality of grain within any given grade that cannot be lower than the minimum quality permitted by several important measures of quality such as test weight per bushel, moisture content, soundness, and foreign-material content. The present official standards for hard red winter wheat, for example, make use of 10 factors for the determination of class, subclass, and numerical grade. The complete grade designation, in these standards, of No. 2 Dark Hard Winter guarantees the buyer that the wheat delivered him under this grade will not contain more than 10 percent of other kinds of wheat of which not more than 5 percent may be durum, will consist of 80 percent or more dark, hard, and vitreous kernels, will weigh not less than 58 pounds per bushel, will not contain more than 14 percent moisture, and will not contain more than 4 percent damaged kernels, etc. Such a grade designation is, therefore, in effect, a guarantee only of the minimum quality permitted by the class, subclass, and numerical grade specifications.

The basic principle for the determination of grade employed in the official grain standards is that grade may be determined from any individual grade factor that represents the poorest quality in the grain. Thus, many lots of hard red winter wheat, especially country-run lots, which, for example, are graded No. 2, No. 3, or No. 4 Dark Hard Winter under the official standards, may possess quality that is superior to that guaranteed only by the straight grade designations No. 2, No. 3, or No. 4 Dark Hard Winter, as the case may be. An example would be a lot of such wheat that was graded No. 2 because it contained 3 percent damaged kernels (No. 1 grade maximum being 2 percent) but which was of No. 1 grade quality according to all other grade factors, also which contained no admixture of other wheats instead of the 10 percent maximum permitted in grade No. 2, also which consisted of 90 percent dark, hard, and vitreous kernels instead of the minimum 80 percent required for the subclass Dark Hard Winter. Such a lot of wheat has a utility value that is distinctly superior to another lot which is of the same grade (No. 2) but which is of the

minimum grade quality permitted by all the factors specified in the standards for the determination of the grade of No. 2 Dark Hard Winter. The grade designation of No. 2 Dark Hard Winter alone does not portray the relatively superior utility value of the first mentioned lot of wheat.

Sample Floor Methods Reveal Superior Qualities Within Grades

Because of such variations in the quality of grain as occur within the limits of any grade according to the individual factors that determine grade, as well as because protein content and buyers' fancies with respect to color, variety, area of production, etc., are not included in grade requirements and designations, the measure of grain quality portrayed by the grade designation is often supplemented in terminal market sample-floor trading procedure by protein tests, analytical information pertaining to the individual grade factors of quality, and by the personal judgment of grain buyers with respect to numerous other measures of quality. Thus, sample-floor trading methods, whereby buyers may examine samples of the grain offered for sale, serve the useful purpose of determining utility values that are not revealed by grade alone. The specialization of trading methods employed on a modern grain exchange "sample floor", when compared with the more simple trading methods of past years, provides ample evidence of the trend toward complexity in grain-marketing practices.

Some of the most important sample-floor methods for evaluating grain which are not included in the present official standards but which are practical for use by inspectors are incorporated in the proposed standards.

Function of Standards in Grain Marketing

The comparatively ideal, competitive, conditions for grain sales, found on the sample-trading floors, do not prevail in the marketing operations for very important segments of the grain crops. In the case of hard red spring wheat and durum wheat, a relatively large proportion of the crops is marketed across the sample floors at terminal markets. With the other classes of wheat, however, a relatively smaller part of the crops is marketed on the sample floors and a relatively larger part moves into the hands of grain users under contracts of one kind or another in which the quality specifications are based on grade alone. In the marketing of corn, oats, barley, and grain sorghums, market practices are based on grades alone to a materially greater extent than on sample-floor trading methods. Viewing grain-marketing practice in its entirety, it is apparent that the grades alone function to evaluate relative quality in grain for many more purposes and for a much greater percentage of the total market grain than do the more complete methods for evaluating grain quality employed in sample trading.

Grain grades are essential in our United States grain commerce, (1) to provide quality specifications for futures contracts, storage contracts, export contracts, contracts between terminal dealers (or processors) and country shippers, contracts between terminal shippers and interior-point consumers, and in the market transactions in grain at country points, (2) to provide definite designations of relative

quality as a basis for market quotations and market news, and (3) to provide a means for reflecting market premiums and discounts according to the most important measures of quality.

In addition to these important functions of the grain standards, the grades and the individual factors of quality specified in the standards and employed by inspectors in their determination of grade, have come to play a most important part in sample-floor trading since the advent of Federal grain standards, in that a record of some of the more important analytical data obtained by inspection departments in the grading of grain is often displayed, together with the grade, on "pan tickets" accompanying the samples, and is used constantly by buyers and sellers in their evaluation of the samples. In other words, the data pertaining to the individual grade factors of the Federal standards are used, in many cases to supplement the grade and the offhand judgment of buyers and sellers as to the quality and condition of the grain, in the sales conducted on sample-trading floors.

VERY COMPLEX STANDARDS IMPRACTICAL

Many revisions of the grain standards have been proposed to the Bureau for the purpose of causing the grades to differentiate the utility values in grain in a more particularized manner than do the present official standards; thus, by such methods, to incorporate in marketing procedure, as conducted by grade, many of the detailed differentiations of value that are now brought out in sample-floor trading. Although the Bureau realizes that values and premiums are often brought out better on the sample-trading floors than under contracts based on grade alone, it realizes also that it is a practical impossibility to formulate grain standards that would differentiate and designate all the numerous utility values in grain that are brought out under the competitive conditions of the sample-trading floors. Some such methods for the differentiation of values, however, may be incorporated in the standards but any attempt to do so in extensive degree would result in standards too complicated for practical, prompt, uniform application by grain inspectors.

VERY SIMPLE STANDARDS FAIL TO MEET TRADE REQUIREMENTS

Numerous revisions of the grain standards have also been proposed to the Bureau for the purpose of reducing the number of classes, subclasses, and grades, thus to simplify inspection, storage, and the buying and handling of grain by grade. Such proposals, if adopted in an extensive degree, would be as impractical as those which propose extensive differentiations of quality by grade. Four numerical grades for corn, for example, instead of the six numerical grades of the present official standards or instead of the five numerical grades of the proposed standards, would have to cover such a wide range in quality within each grade that they would be relatively indefinite as designations of quality, and would function, therefore, to establish prices by grade that would be manifestly unfair to producers and shippers whose corn was of superior quality within any 1 of the 4 grades.

Similarly, were the wheat standards to be simplified materially, by eliminating all or part of the subclasses, which are based on kernel texture requirements, an injustice would be done (1) to many millers who, by reason of geographic location and lack of protein-

testing facilities, must rely on the subclass specifications in making purchases of wheat to meet their particular requirements, (2) to many producers whose wheat is not marketed in channels where protein testing is a commercial measure of quality, but under conditions where relative milling value may be differentiated approximately by means of subclass specifications, and (3) to that part of the grain trade which assembles, conditions, and prepares large lots of wheat to meet the requirements of futures or export contracts, in which phases of wheat marketing the approximate measure of milling quality covered by the subclasses is essential. It is possible that the protein test may be adopted so widely at some future time as a commercial measure of the potential "baking quality" of wheat as to practically eliminate the commercial need for the wheat subclasses, but the Bureau is of the opinion that that situation does not now exist. Were the protein-testing service to be developed in a national manner so as to provide uniform methods of testing, premarketing protein surveys, and current market news service, as outlined in Department Miscellaneous Publication No. 140, there would be less need for the wheat subclasses than under existing conditions.

Many other illustrations might be given of the difficulties that would be encountered in any attempt to simplify materially the grain standards. It is believed, however, that these illustrations will suffice, especially when considered in connection with the statements previously made with reference to the apparent trend toward complexity in trade practices.

TRADE PRACTICES JUSTIFY MORE GRADES

The proposed standards comprise a greater number of possible grades and grade combinations than do the present official standards. Some simplification has been effected, notably in the barley, oats, corn, and grain sorghums standards. On the other hand, the addition of one new subclass for white wheat, one new subclass for durum wheat, a new subclass for malting barley, special grades for Tough and Stained grain, special grades for Heavy and Extra Heavy oats, the adoption of the dockage system for barley and grain sorghums, and other proposed revisions of a more or less similar character, would increase the total number of grade designations.

The proposed increase in the possible number of grade designations is justified by modern trade practices and is essential to an attainment of the objectives sought in improving the standards. Such new grades should serve a useful purpose in grain commerce. It should be observed that several of the proposed new grade designations would take the place of certain mandatory and permissive notations now made on certificates under Remarks, and that practically all the proposed new grade designations have a definite relation to some utility value in grain or to some well-established market preference pertaining to grain quality which functions to establish premiums or discounts.

GRADE REVISIONS IN RELATION TO INSPECTION PROCEDURE

The problems of the grain-inspection agencies have been given careful consideration in the formulation of these proposed standards. The proposed revisions would not increase materially the work of inspectors. In considering the administrative practicability of the

proposed standards, it should be kept in mind that the grain standards, as a whole, must be formulated so far as possible, to cover the variations in grain quality throughout the entire country. At any given inspection point, however, the grain crops produced in tributary areas in any given year do not usually contain many of the variations in quality covered by the proposed new grades. The great bulk of the receipts of country-run grain would fall into the straight numerical grades as heretofore. Thus it follows that the possible total number of grades would practically never be in use in any given market at a given time. In other words, conditions would seldom require the use of all of the proposed new grades at any given time or place. In some markets, however, and for some kinds or classes of grain, the proposed standards would undoubtedly require some additional sample analytical work on the part of inspectors as compared with the work required by the present official standards. The real function of all grain-inspection agencies is to render the service needed insofar as it is practicable to do so. Thus, if such additional duties increased the value of the service for the grain industry, they are fully justified

GRADE REVISIONS IN RELATION TO WAREHOUSE OPERATION

The problems of the public warehouses and terminal elevators have been given much consideration in the formulation of these proposed standards. It is realized that efficient terminal elevator operation requires an economical use of bin space and the storage of large lots of grain under as small a number of different classes and grades as are essential to meet commercial requirements.

Nevertheless, the operations of the terminal elevators show a trend toward complexity in grain handling and storage that is similar to the trend toward complexity in grain users' requirements and in the grain standards. Modern terminal grain elevators now have a greater number of bins and are much better equipped to clean, condition, and mix grain than the elevators of the pioneer days of grain handling and storage. The majority of them are now equipped to perform three separate and important functions in the movement of grain from producer to consumer, namely: (1) the public storage of large lots of grain that are sound and in good condition for storage, fungible in character, and of such quality as to conform to all the requirements of those grades that are of chief commercial importance; (2) the storage in special bins, for the account of millers, cooperative associations, grain dealers, or the warehouse operators, of large lots of grain having special qualities not fully covered by grades, such as protein content, variety purity, or high test weight; and (3) the removal of dockage from grain, also the cleaning, conditioning, and mixing of grain that was of low grade when received into the elevator, because it contained an excessive quantity of foreign material, other grains, moisture, smut, or ergot, etc., for the purpose of raising its grade.

Public Storage of Grain

That part of the grain crop received at public elevators and which goes into public storage immediately, consists chiefly of grain that meets all the grade requirements of one or the other of the most important commercial grades. Various lots of such grain, therefore,

may be stored in large bins with other lots of grain of the same grade at the time of their receipt.

The special binning of grain is a procedure based on private contract between the depositor and the warehouse operator, with which procedure the proposed grade revisions are not especially concerned.

In public warehouse practice it is impractical under the present official standards, or would be under the proposed standards, for the warehouseman to store and issue receipts for grain of different low grades because of this or that grade factor which necessitates the cleaning, conditioning, and blending of such grain before it is ready for use. Thus it is now a common practice for elevators to refuse public storage on so-called "off-grade" grain. Such grain may be "hospitalized" by the warehouseman, where possible and where desired, for the account of the owner, and subsequently placed in public storage in bins containing grain of similar grade, but the more common practice is for warehousemen to purchase for their own accounts those lots of grain, which at time of receipt, do not meet the requirements of the important commercial grades. Such grain, owned by the warehouse operator, often is stored in private bins according to numerous individual factors of quality, such as test weight, mixtures of other grains, damaged kernels, foreign material, etc. Subsequently such grain is cleaned, conditioned, or blended, when necessary, to meet the requirements of the most important commercial grades, after which the grain may be delivered out of the elevator or it may be transferred to public-storage bins containing fungible grain of the important grades, thus to economize storage space. Such operations are common in most modern terminal elevators.

These methods of warehouse procedure are recognized as being essential to the efficient marketing, handling, and storage of the grain crops, and, in order that elevators may perform these three important functions in grain commerce, the so-called "public warehouses" are usually divided for operative purposes into two parts, one of which is public and consists of numerous large bins in which large quantities of sound grain, fungible as to grade, and of but a few important grades for each kind of grain, are stored; and the other of which is the private workshop of the warehouse operator and consists of numerous bins in which grain is stored temporarily pending its preparation for sale or for storage in either the public part of the house or in special bins.

Few Grades Used in Public Grain Storage

The purpose in outlining these common practices in terminal elevator operation is that of developing the fact that only a relatively small number of the most important grain classes and straight numerical grades are now employed under the present official standards in connection with public-storage operations. The same straight numerical grades and the same public-storage methods, to a very large extent, would be used under the proposed standards, because only in a few instances revisions that would affect the number and character of the straight numerical grades commonly used in public-storage operations have been proposed. It is recognized, however, that in case of wheat the one additional subclass for white wheat, and the one additional subclass for durum wheat, that are included

in the proposed standards would probably require an increase in the number of bins for public-storage purposes. These proposed subclasses, however, should be of value to the producers, millers, and exporters of grain, and the elevators should meet trade requirements in such respects just as they have met new trade and grain standards' requirements in the past when the official subclasses for Hard Red Spring and Hard Red Winter wheat were adopted and when it became necessary to meet trade requirements by the providing of special bins for the storing of wheat according to protein content.

Special Grades in Relation to Grain Storage

An examination of the new special grades in the proposed standards, as well as the proposed revisions of the existing classes, subclasses, and numerical grades, will disclose the fact that these changes would affect grain storage operations in minor degree only. The effect that some of the most important proposed special grades would have on public storage is discussed in the next four paragraphs.

The proposed special grades such as Heavy and Extra Heavy for oats, and Bright for barley and grain sorghums, are grades that indicate relatively superior quality. Grain of the commercially important numerical grades that would also meet the requirements of these special grades should be acceptable for public storage; thus, to this extent, additional bins for the public storage of these grains would be required, principally for oats and grain sorghums. Whenever such additional bin space is necessary it should be pointed out that the separate binning, according to grade, of grain which has relatively superior utility and market value, in conformity with consumer requirements, should be of benefit generally to the grain industry in the handling of these crops between the producer and the consumer.

Although the proposed special grades for "Test Weight of Western Barley" would increase the number of grades for such barley, they would not cause any new problems of importance in the handling and storage of Western Barley, because of the fact that such barley is now largely handled, stored, and merchandised in the far Western States according to its test weight per bushel as well as by its numerical grade.

Other special grades included in the proposed standards, such as Tough for wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley, Smutty for oats, Feed Oats, and Mixed Feed Oats, and Ergoty for wheat, are grades that indicate so-called "off-grade" character, including excess moisture in grain, all of which usually cause such grain to be unacceptable for immediate public storage. Thus, these special grades would have little or no effect on grain storage procedure. This principle may be well illustrated with the proposed special grade Tough, as applied to hard red spring wheat. If a lot of such wheat arrives at the elevator with a moisture content of 15.5 percent, it makes no difference in elevator management whether such wheat is graded No. 4 Northern under the present official standards or graded No. 1 or 2 Northern, Tough under the proposed standards, because irrespective of which one of these grade designations is assigned, such wheat must be rehandled and mixed with dry wheat, or conditioned, before it is ready for safe storage. In fact, such a grade as No. 1 Northern, Tough, is a much more descriptive designation of wheat quality than No. 4 Northern, and should be of advantage to the ele-

vator operator in that it would indicate the kind of conditioning necessary and the ultimate grade attainable if properly conditioned.

In all these cases of so-called "out-of-condition" or "off-grade" grain, the character of the grain and its fitness for storage are identical under the grade designations of either the present official standards or the proposed standards. In either case the warehouse operator has the option of accepting or rejecting the grain for immediate public storage, accepting it for conditioning or cleaning for the account of a customer, or of purchasing it to handle for his own account, according to the bin space and other facilities available at the time the grain is tendered.

Proposed New Grades Useful for Purposes Other Than Grain Storage

In all discussions of the grain standards in their relation to elevator management, three important points should always be kept in mind, namely: (1) That practically all grain stored in public warehouses either is of such quality as to come within the requirements of a small number of the most commercially important numerical grades, or possesses such qualities as to cause owners to store it in special bins; (2) that a very high percentage of the grain which goes into storage is owned by large mills, large grain firms, large cooperative associations, and the warehouse operators, all of which depositors deal in large volumes of grain and are fully competent to arrange for the conditioning and blending of grain, where necessary, prior to storage; and (3) that practically all tough and smutty grain, or grain containing excess quantities of other grains or foreign material, or other types of off-grade grain, is purchased by the elevator operators and rehandled, or conditioned, or mixed by them in that part of the warehouse that is not used for public-storage purposes.

The principal purpose of the proposed new classes, subclasses, and grades is to differentiate and designate, more clearly than the present official standards, the important values in country-run grain while it is moving along the channels of trade prior to its ultimate storage in terminal storage or users' elevators. Once the crops have gone into such storage the need for numerous grades disappears, and all trade requirements are met thereafter by a small number of unqualified numerical grades that are customarily known as the "contract grades." Under the proposed standards, as under the present official standards, the grain trade is privileged to select, from among the total number of grades, those grades that are most suitable to use in public storage, futures contracts, and export contracts, or in any merchandising operation covering a lot of grain that must conform to a contract guarantee of uniform quality.

PRINCIPAL PROPOSED REVISIONS AND ADDITIONS

MIXED GRAIN STANDARDS

The official grain standards now in force do not include standards for several important mixtures of different kinds of market grain. The maximum amount of other cereal grains permitted in wheat, for example, is 10 percent; in rye, 10 percent; in barley, 25 percent; and in grain sorghums, 35 percent. Numerous car lots of wheat that contain more than 10 percent of rye, or car lots of rye that contain more than 10 percent of wheat, or car lots of barley that contain more

than 25 percent of oats or wheat, or other mixtures that are not provided for in the present official grain standards, are received at the terminal markets. Such grain mixtures are commonly designated as "nonstandard" when inspected by licensed inspectors or Federal supervisors for the purpose of determining whether or not the mixture is such as to come under the standards for wheat, rye, barley, etc.

Although Mixed Grain does not comprise a material part of the grain receipts, several hundred car lots are received annually in each of the most important terminal markets. According to the biennial report of the Minnesota State Grain Inspection Department, for example, for the period ended August 31, 1930, the annual receipts of such grain at Minnesota markets, during the 14-year period, 1916–17 to 1929–30, ranged from 319 car lots to 2,182 car lots; there were 4 years when the receipts exceeded 1,500 car lots and 6 years when they exceeded 1,000 car lots.

Many of these car lots of Mixed Grain are usable by millers, others are usable by elevators for blending purposes, whereas others are merchandized in the feed trade. To meet trade requirements in handling and merchandising such grain mixtures, various State and commercial exchange inspection departments have formulated standards for Mixed Grain. In order to standardize the inspection and certification of grain mixtures that do not conform to the official standards for wheat, rye, barley, oats, Feed Oats, Mixed Feed Oats, corn, and grain sorghums, the Bureau proposes the promulgation of official standards for Mixed Grain, by means of which all licensed inspectors and Federal supervisors may certify the essential facts about the character of these grain mixtures, such as the percentage quantity of each kind of grain and the percentage quantity of foreign material, together with notations under Remarks of other important information such as test weight per bushel, moisture content when not in a warehousable condition, and damage when in a quantity greater than 7 percent.

DEFINITIONS FOR EACH KIND OF GRAIN

The proposed standards for Mixed Grain comprise only the mixtures of those kinds of grain for which official standards are in effect under the provisions of the Grain Standards Act. Thus, in order to provide a definite cut-off between those grain mixtures that come under the standards for wheat, rye, oats, Feed Oats, Mixed Feed Oats, barley, corn, or grain sorghums, and those mixtures that come under the standards for Mixed Grain, the definitions for the various kinds of grain have been so revised as to meet this new requirement.

In the main these revised definitions would have but little effect on the character and extent of the mixtures permitted in the standards for wheat, rye, oats, Feed Oats, Mixed Feed Oats, barley, corn, and grain sorghums. In this respect there is no change in the wheat, rye, oats, and barley standards. No limitation for other grains in corn is provided by the official standards, whereas the proposed standards include a limit of 10 percent. With grain sorghums, the official standards permit a maximum content of 35 percent nongrain sorghums and/or other cereal grains, whereas the proposed standards would establish separate limits of 25 percent for nongrain sorghums and 10 percent for other grains.

The most important revision in the definitions of the kinds of grain occurs in the proposed standards for oats, wherein "oats" are so defined as to permit not more than 10 percent of wild oats, whereas the present official standards for oats contain no special limit on wild oats. Thus, under the official standards a lot of white oats containing more than 10 but not more than 20 percent of wild oats, but otherwise meeting all the requirements of No. 1 White Oats, is graded as Sample grade White Oats, whereas under the proposed standards such a lot of oats would grade No. 1 Feed Oats. This revision would provide a much more descriptive grade designation for oats containing a comparatively small quantity of wild oats than the designation provided by the official standards.

MOISTURE CONTENT

The facts developed from a careful study of the use and application of the grade factor "moisture content" in the official grain standards, justify a recommendation to eliminate moisture content as a factor for the determination of numerical grade in the standards for wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley. In lieu of the present official grade specifications for moisture content for these kinds of grain, it is proposed that, for each kind of grain except corn and grain sorghums, as well as for Mixed Grain, there should be specified a uniform, maximum moisture content for each numerical grade, which moisture content should not exceed the maximum known from experience usually to assure safe storage. In case of hard red winter wheat, as an illustration, it is suggested that this moisture limit for the straight numerical grades be established at 14 percent, which is the present moisture limit for the important contract grade No. 2 in this class of wheat. Thus a contract for No. 4 Hard Winter wheat, for example, under the proposed standards, would guarantee a delivery of wheat in good condition for transportation and storage, so far as moisture is concerned, just as such a condition is now guaranteed by the grade of No. 2 Hard Winter under the official grain standards.

Proposed Special Grade for Tough Grain

Under the present official standards for hard red winter wheat, the maximum moisture content for grade No. 5 is 15.5 percent, and a greater moisture content causes the wheat to grade Sample grade. If, as specified in the proposed standards, a maximum moisture content of but 14 percent is allowed for the straight numerical grades 1 to 5, inclusive, the problem remains of how lots of wheat that have moisture contents ranging from 14.1 to 15.5 percent, inclusive, should be graded. It is proposed to grade such wheat, so far as moisture content is concerned, under a new special grade entitled "Tough", which grade would be included in, and made a part of, the complete grade designation, for wheat of any grade, in the same manner as is now followed under the official standards for smutty wheat.

It is further proposed to require all licensed inspectors and Federal supervisors, by regulation, to determine the actual moisture content of all lots of wheat and corn of any grade; of all lots of grain sorghums which are graded lower than No. 2 on any factor; of all lots of rye, oats, Feed Oats, Mixed Feed Oats, barley, and Mixed Grain, which are graded Tough or Sample grade; and to note the moisture percentage,

so determined, under Remarks, in all certificates issued except in those issued for export shipments.

It is obvious that for many lots of wheat the quality and utility value could be more clearly and accurately shown by these methods than by the present official grade requirements for moisture content. Early marketed, new-crop hard red winter wheat, for example, containing 14.3 percent moisture, but having a test weight per bushel of 60 pounds and otherwise meeting the requirements of grade No. 1, is graded No. 3 Hard Winter under the present official standards, whereas under the proposed standards it would grade No. 1 Hard Winter, Tough, supplemented by the statement "14.3 percent moisture", under Remarks. The latter designation comprises a much more descriptive and accurate designation of such wheat than the former, and would be more useful to producers, shippers, elevator operators, and millers, than the grade designation of No. 3 which, in fact, comprises a wide range of quality according to the possible combinations of the various grade factors.

The proposed methods for handling the moisture factor in hard red winter wheat given in the previous paragraph, are illustrative of the methods proposed for all classes of wheat, as well as for rye, oats, Feed Oats, Mixed Feed Oats, barley, and Mixed Grain. Different moisture limits, however, are specified for the various classes of wheat and for the different kinds of grain.

Moisture Specifications in Relation to Inspection Efficiency

Four principal reasons have motivated the Bureau in making these recommendations pertaining to the grade factor of moisture content. The first and probably the most important of these reasons is that of inspection efficiency and intermarket uniformity in the application of the standards.

Inspection experience has shown that considerable variation in the grades assigned to wheat by different markets or inspectors is caused by the one half percent moisture content intervals between grades 1 and 2, and between grades 2 and 3, of the present official wheat standards. These moisture content intervals between the important contract grades of wheat are too narrow for practical application by inspectors. In the operation of the Brown-Duvel moisture-testing apparatus a constant possible error factor of about 0.3 percent is present even with standardized equipment and careful management, whereas with apparatus that may be slightly nonstandard, or apparatus operated with variable gas quality or pressure or with careless management, the error factor may be, and sometimes is, as great as 0.5 or 0.6 percent. It is questionable, also, whether the more modern electric moisture-testing equipment can be relied on to eliminate the possible error factor in making moisture determinations below that of 0.3 percent. For these very practical reasons, the one half percent moisture content intervals between some of the wheat grades are, at times, a source of considerable nonuniformity in the application of the wheat standards.

The proposed grade Tough, for each kind of grain to which it is applicable, would cover a range of 1½ percent in moisture content, thus establishing in the wheat standards, for example, but two dividing lines in quality based on moisture, namely, that one between

dry and tough grain and the other between tough grain and Sample grade grain, instead of the four dividing lines between the grade requirements for moisture of the present official wheat standards. This simplified procedure in the application of the moisture-content factor would certainly result in an improvement in inspection efficiency.

Grading of Wheat Containing Excess Moisture Content

The second principal reason which motivated the Bureau to recommend the adoption of special grades for Tough grain is that there is a material volume of new-crop wheat marketed in many years under the present official grade designations of No. 2, No. 3, and No. 4, which is of No. 1 or No. 2 grade quality except for the factor of moisture.

According to inspection data covering supervised receipts of hard red winter wheat at all United States markets for the 9-year period 1923–24 to 1931–32, an average of approximately 7 percent of such receipts graded No. 2 and lower and approximately 4 percent graded No. 3 and lower on account of moisture content.[37] During this 9-year period at all markets there were three crop years when the percentages of receipts that graded No. 2 and lower, according to the moisture factor, ranged from approximately 11 percent to 13 percent, while the percentages that graded No. 3 and lower on this factor ranged from approximately 6 percent to 9 percent. Similarly at Kansas City, for the same period, the average quantity of hard red winter wheat receipts that graded No. 2 and lower was approximately 5 percent, and the average quantity that graded No. 3 and lower was approximately 4 percent of the receipts, while there were two crop years when the quantities of receipts that graded No. 2 and lower ranged from approximately 10 percent to approximately 18 percent, and the quantities that graded No. 3 and lower ranged from approximately 8 percent to approximately 16 percent. Similarly at Omaha, for the same period, the average quantity of receipts that graded No. 2 and lower was approximately 14 percent and the average quantity that graded No. 3 and lower was approximately 9 percent, while there were three crop years when the quantities of receipts that graded No. 2 and lower ranged from approximately 23 percent to 32 percent and the quantities that graded No. 3 and lower ranged from 16 percent to approximately 21 percent.

Moisture content is a factor of greater significance in determining the grade of the soft red winter wheat crops than it is for the crops of hard red winter wheat. According to inspection data covering

[37] At numerous places in this report, data from inspection records are used to illustrate how the market receipts of grain have graded according to the grades or grade factors of the present official standards. Inspection data described as "data covering supervised receipts" were compiled from the analytical data recorded by Federal grain supervisors in connection with their grading of grain for both appeal inspection and supervision purposes. Inspection data described as "data compiled from total inspections" or "from the inspections made by licensed inspectors", refer to data compiled from the information given on the original certificates of inspection issued by Federally licensed grain inspectors. Although the data available from original inspections cover a larger and more representative quantity of grain receipts than do the data taken from supervised receipts, they do not provide much information about the relative importance of the various individual grade factors in the determination of numerical grade. For this reason, it has been necessary, in this report, to make a wider use of data from supervised receipts than of data from original inspection certificates, even though it is recognized that in some cases and at some markets such data may have been derived more largely from appeal inspections than from supervised inspections, and thus may not be fully representative of the market receipts of grain, because many of the appeal inspections are made on car lots of grain that may not be representative of the average quality of country-run grain. By and large, however, the data obtained from supervised receipts indicate whether any individual grade factor affects the determination of grade in relatively small, medium, or large degree, thus providing information of value in the solving of certain grain-standardization problems. The data compiled from supervised receipts, however, should not be considered always as being fully representative in character, although they often are so when the so-called "supervised receipts" comprised no excessive proportion of appeal inspections.

supervised receipts of soft red winter wheat at all United States markets for the 9-year period 1923–24 to 1931–32, an average of approximately 34 percent of such receipts graded No. 2 and lower and 22 percent graded No. 3 and lower on account of moisture content. During this 9-year period at all soft red winter wheat markets there were 4 crop years when the quantities of receipts that graded No. 2 and lower, according to the moisture factor, ranged from approximately 45 to 59 percent, while the quantities that graded No. 3 and lower ranged from approximately 29 to 46 percent. Similarly at Baltimore, for the same period, the average quantity of soft red winter wheat receipts that graded No. 2 or lower on the moisture factor was approximately 59 percent, and the average quantity that graded No. 3 and lower was approximately 40 percent, while there were 4 crop years when the quantities of receipts that graded No. 2 and lower ranged from approximately 65 to 88 percent, and the quantities that graded No. 3 and lower ranged from approximately 42 percent to approximately 74 percent.

Although data are not available to show the exact percentages of hard red winter and soft red winter wheat receipts that graded No. 3 or lower because of the moisture factor but were otherwise of No. 1 or No. 2 grade quality according to all grade factors except moisture, it is known from the observation and experience of grain inspectors and Federal grain supervisors that in many years there is a material portion of the wheat receipts marketed during June, July, August, and September, that is of No. 1 or No. 2 grade quality in all respects except that of moisture content.

Where wheat containing excess moisture is consigned and sold by an active commission merchant under competitive conditions on a sample-trading floor, its value according to test weight, soundness, and purity, is usually recognized and reflected in the market price. But as has been heretofore pointed out, there are very important segments of the wheat crop that are merchandised by grade alone under contracts of one kind or another, and under conditions where the values represented by individual factors of quality are not brought out. Market prices for wheat of No. 2, No. 3, or No. 4 grade tend to be based on the minimum quality possible within any one of these grades, so that when the grade designation No. 3, for example, is applied to new-crop wheat that is of No. 1 quality except for the factor of moisture that caused the grade of No. 3 to be assigned, the true, relative, utility value of such wheat for blending purposes or for direct use is not accurately and equitably portrayed. The quality and utility values of such wheat are portrayed much better for millers and elevator buyers by a grade designation such as No. 1 Hard Winter, Tough, supplemented by a statement such as "14.2 percent moisture" under Remarks, than is the case when the wheat is designated as No. 3 Hard Winter according to the present official standards.

Market Quotations for Spring Wheat Containing Excess Moisture but Otherwise No. 1 Northern

Market quotations and practices in the spring-wheat area indicate that the grain trade in that area has a thorough understanding of the qualities and values in wheat that contains excess moisture but which is otherwise of superior quality, and that the trade has already devised descriptive designations for such wheat by means of which

definite price quotations may be made on a different basis of value than that represented by the straight numerical grades of the official grain standards.

The Grain Bulletin at Minneapolis, for example, issues daily price quotations for the use of buyers at country points in the spring-wheat area. These quotations include basic prices by numerical grade (exclusive of protein), also discounts under No. 1 Northern for wheat containing 15 percent moisture but otherwise No. 1 Northern, and for wheat containing 16 percent moisture but otherwise No. 1 Northern (exclusive of protein). The prices so quoted, therefore, for wheat containing excess moisture but otherwise No. 1 Northern are in effect quotations for wheat that, in fact, possesses the same qualities as those represented by the proposed grade No. 1 Northern, Tough (Remarks, 15 percent moisture) or No. 1 Northern, Tough (Remarks, 16 percent moisture).

The Bureau has made a study of those prices and discounts that were quoted by the Grain Bulletin for use at northern points (North Dakota and northern Minnesota) during the 7-year period 1926–27 to 1932–33, inclusive, from which study price comparisons may be made (1) between the quotations for wheat containing 15 percent moisture but otherwise No. 1 Northern and the quotations for wheat of the grade No. 3 Northern, and (2) between the quotations for wheat containing 16 percent moisture but otherwise No. 1 Northern and the quotations for wheat of the grade No. 4 Northern.

In these comparisons it should be kept in mind that the trade terms "wheat containing 15 percent moisture but otherwise No. 1 Northern" and "wheat containing 16 percent moisture but otherwise No. 1 Northern" designate the same qualities in wheat as those designated by the proposed grade terms "No. 1 Northern, Tough" (remarks, 15 percent moisture) and "No. 1 Northern, Tough (remarks, 16 percent moisture), also that, under the present official standards, the numerical grade of hard red spring wheat containing 15 percent moisture is No. 3 and the grade of wheat containing 16 percent moisture is No. 4.

From this price analysis study in the spring-wheat area the following summarized facts appear:

(1) During the 7-year period 1926–27 to 1932–33, inclusive, the average price for wheat containing 15 percent moisture but otherwise No. 1 Northern was approximately 1½ cents per bushel higher than the price of No. 3 Northern, and the average price for wheat containing 16 percent moisture but otherwise No. 1 Northern was approximately 4 cents per bushel higher than the price for No. 4 Northern.

(2) During the 5-year period 1926–27 to 1930–31, inclusive, the average price for wheat containing 15 percent moisture but otherwise No. 1 Northern was approximately 2 cents per bushel higher than the price of No. 3 Northern, and the average price for wheat containing 16 percent moisture but otherwise No. 1 Northern was approximately 5 cents per bushel higher than the price for No. 4 Northern.

(3) During the 5-year period 1926–27 to 1930–31, inclusive, there were many weeks when the prices for wheat containing 15 percent moisture but otherwise No. 1 Northern were higher by 3 to 5 cents per bushel than the prices for No. 3 Northern, and when the prices for wheat containing 16 percent moisture but otherwise No. 1 Northern were higher by 5 to 9 cents per bushel than the price for No. 4 Northern.

(4) During the 2-year period 1931–32 and 1932–33, inclusive, the average price for No. 3 Northern was approximately one half cent per bushel higher than the price for wheat containing 15 percent moisture but otherwise No. 1 Northern, although, in case of wheat containing 16 percent moisture but otherwise No. 1 Northern the average price for such wheat was approximately 1 cent per bushel higher than the price for No. 4 Northern.

It is apparent from these data that the Grain Bulletin quotations for wheat containing excess moisture (15 to 16 percent) but otherwise meeting the requirements of the grade No. 1 Northern were consistently and materially higher than the quotations for No. 3 and No. 4 Northern wheat until all wheat prices descended to the abnormally low levels of the 1931–32 and 1932–33 seasons.

It is further apparent that the chief reason for the diminished spreads or loss of spreads in favor of wheat containing excess moisture in the years 1931–32 and 1932–33, was the fact that when all wheat prices dropped sharply in 1931 the discounts theretofore prevailing of 4 cents per bushel under the price of No. 1 Northern for wheat containing 15 percent moisture but otherwise No. 1 Northern, and 6 cents per bushel for wheat containing 16 percent moisture but otherwise No. 1 Northern, were not adjusted downward in accordance with the sharply decreased price level for wheat, but remained stationary.

It may be contended logically that if a discount of 4 cents per bushel represents the difference in utility value between No. 1 Northern wheat and wheat containing 15 percent moisture but otherwise No. 1 Northern when the general price level for wheat is $1 per bushel, the same relative utility values in wheat of similar qualities should be expressed by a discount of 2 cents per bushel when the general price level for wheat is only 50 cents per bushel. For this reason the relationships between prices by grade and discounts for excess moisture in the years 1931–32 and 1932–33 are not as representative relationships for the purposes of this study as those above shown for the years 1926–27 to 1930–31.

Even though the existing discounts of 4 and 6 cents per bushel for wheat containing 15 and 16 percent moisture, respectively, but otherwise of No. 1 grade, should prevail in the future (although illogical for 50- to 75-cent wheat), it is reasonble to assume that the general price level for wheat in future years is not likely to remain at an abnormally low level, and, therefore, that with an increase in the general price level the future price spreads for so-called "tough wheat" will be more nearly in accordance with the spreads for the years 1926–27 to 1930–31, inclusive, than with the spreads for the years 1931–32 and 1932–33.

It is apparent from these studies that the principles of the proposed grades for Tough wheat, rye, oats, Feed Oats, Mixed Feed Oats, barley, and Mixed Grain, as they relate to market procedure, are already well understood by at least a part of the grain industry, and that an effective use is being made of them. The incorporation of these principles in the grain standards for the grading of grain which contains excess moisture but which is otherwise of superior quality should be of value to the grain industry in that it would cause the quality and condition of such grain to be certificated more clearly than under the principle of using moisture content as a factor for the determination of numerical grade. The adoption of these principles should

assist grain buyers and users in making selections, and should emphasize and bring out the value in many lots of grain that meet the requirements, except for moisture, of the top grades.

Proposed Moisture Specifications Would Improve Some Contract Grades

The third principal reason for recommending special grades for Tough grain is that the proposed revisions pertaining to the moisture-content factor would effect an improvement in one of the contract grades for wheat, rye, and barley. For example, in the present official standards for hard red spring and durum wheat, grade No. 3 may contain a maximum of 15 percent moisture, and in the standards for hard red winter, soft red winter, and white wheat, grade No. 3 may contain a maximum of 14.5 percent moisture. These moisture limitations are slightly in excess of the maximum moisture content usually associated with safe storage quality, hence they function in grain-marketing operations to depreciate the acceptability of No. 3 contract wheat and to widen the discounts applied to it.

Under the present official standards, hard red winter wheat, for example, which grades No. 3 Hard Winter because of 56 pounds test weight per bushel and grades No. 3 because of 14.5 percent moisture is deliverable on contracts for No. 3 Hard Winter and usually on contracts for No. 2 Hard Winter, at a discount of about 3 cents per bushel under the current price for No. 2 Hard Winter wheat; whereas, under the proposed standards, such wheat would grade No. 3 Hard Winter, Tough, and would be disqualified, therefore, from being deliverable on contracts for either No. 3 Hard Winter or No. 2 Hard Winter because of the special grade Tough.

Under the proposed standards, wheat of the straight grade No. 3 could not contain any more moisture (not over 14 percent) than wheat of the straight grades No. 1 and No. 2; thus, the threat of accepting a contract delivery of No. 3 wheat containing too much moisture for safe storage would be eliminated, the acceptability of No. 3 wheat, therefore, would be enhanced, and the discount for such wheat should logically be narrowed.

This improvement in the straight No. 3 grade for wheat is of material significance with respect to the quality of wheat represented by the contract grade No. 3, especially when considered in connection with the proposed restriction on the maximum special limitations on Durum and/or Red Durum in the No. 3 grade, and in connection with the proposed restrictions on the mixing into wheat of damaged other grains and unnatural material.

Moisture Not a Measure of Fixed Value

The fourth principal reason for this proposal to eliminate moisture content as a factor for the determination of numerical grade in the standards for wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley, is that moisture content is not a measure of the fixed and permanent utility values in grain. Moisture content is susceptible of rapid change during the period of handling grain between the producer and the consumer by means of artificial drying, aeration by moving grain, and by blending moist grain with dry grain. For these reasons moisture content should not function as a factor for the

determination of numerical grade on a basis of equality with the other numerical grade factors of the grain standards.

Grading of Oats and Barley Containing Excess Moisture

The principal reasons above stated for eliminating moisture content as a factor for the determination of numerical grade, except in case of corn and grain sorghums, have been exemplified chiefly with wheat because of its relative importance as a market grain crop. There are other reasons that may be well exemplified with oats and barley.

Moisture content is a relatively unimportant factor in determining the grade of oats under the present official standards. According to inspection data covering the supervised receipts of oats in all United States markets for the 9-year period 1923–24 to 1931–32, an average of only about 2 percent of such receipts contained more than 14.5 percent moisture and were, therefore, graded No. 4 and Sample grade on this factor. In the crop year 1926–27, however, approximately 9 percent of the oats receipts were graded No. 4 and Sample grade because of moisture content.

Although the factor of moisture content does not function to determine the grade of a large segment of the market receipts of oats, when it does apply, under the present official standards, it may function to lower sharply the grade of oats from No. 1 to No. 4 for those lots of oats which are of No. 1 quality but for a slight excess of moisture. Such lowering of grade in the present standards is caused by the use of a single moisture specification (14.5 percent) in the oats standards for each of the grades No. 1, No. 2, and No. 3. Thus, if the moisture content of a lot of oats is 14.8 percent, the grade is lowered to No. 4, irrespective of the fact that the grade on all other factors may be No. 1 or No. 2.

Moisture content is a grade factor of much more importance in determining the grade of barley of the class Barley of the present official standards than it is in the case of oats. According to inspection data covering the supervised receipts of barley (Class Barley) in all United States markets for the 6-year period 1926–27 to 1931–32, an average of approximately 12 percent of the receipts were graded No. 2 (third grade) and lower because of moisture content in excess of 14.5 percent, while in the crop year 1926–27 approximately 54 percent of such receipts were graded No. 2 (third grade) and lower because of the moisture factor.

The grade of barley (Class Barley) which is of No. 1 quality except for moisture and which contains but a slight excess of moisture for grade No. 1, is lowered under the moisture specifications of the present official standards from No. 1 to No. 2 (third grade) instead of to Special No. 2 (second grade) because the moisture specifications for grades No. 1 and Special No. 2 are identical—14.5 percent. Thus, if a lot of barley meets all the requirements for grade No. 1 except that it contains 14.7 percent moisture, the grade is lowered two grades on this factor. Similarly, the moisture specifications for grades No. 2, No. 3, No. 4, and No. 1 Feed, of the present official standards for the class Barley are identical—15.5 percent. Thus, if a lot of barley meets all the requirements of grade No. 2 except that it contains 15.7 percent moisture, the grade is lowered to Sample grade or a drop of four grades on this factor.

Grade specifications for moisture content that cause the straight numerical grade to drop two or more grades according to this single factor of quality work an injustice on some lots of grain that have superior utility value except for small excesses of moisture content. For these reasons the grading principles of the proposed standards with reference to the moisture content of oats and barley, which would designate oats and barley (Class Barley) as, for example, No. 1 Barley, Tough, No. 2 Barley, Tough, etc., when they contain more than 14.5 but not more than 16 percent moisture, are more equitable and logical than the moisture specifications of the present official standards.

Tough Grade Not Proposed for Corn and Grain Sorghums

Although these statements about moisture content are as logical for corn and grain sorghums as for wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley, it is not recommended in the proposed standards to eliminate moisture as a numerical grade-determining factor for corn and grain sorghums. There are two reasons for this:

(1) The moisture content grade specifications of the official standards for corn are based on 1.5- to 2-percent intervals between grades and for grain sorghums on 1- to 2-percent intervals, and in the proposed standards for corn they are based on 2- and 3-percent intervals and for grain sorghums on 1- and 2-percent intervals. Thus, for these grains, the possibilities for misgrading are not as great as in case of wheat, for example, where, under the present official standards, some of the moisture content intervals between grades are as small as 0.5 percent.

(2) The total range in the moisture content of commercial lots of corn and grain sorghums is much greater than in the case of wheat, rye, oats, or barley. For either corn or grain sorghums this range is too great to be included practically in a single special grade for Tough in a manner comparable with the grade requirements for Tough in the proposed standards for wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley. The same principle could be established in the standards for corn and grain sorghums only by the adoption of a series of special grades for the moisture content range in excess of that moisture content percentage which assures safe storage. A series of grades for excess moisture for corn and grain sorghums, such as Tough, Moist, and Damp, for example, would complicate the standards unduly and probably be no more acceptable to the grain industry than the present moisture content grade requirements of the official standards.

Certification of Moisture Content for All Wheat and Corn

The Bureau believes that the recommended policy of stating the percentage of moisture on all certificates for wheat and corn, irrespective of grade, except those certificates issued for export shipments, would result in material benefits to producers, handlers, and users, of these grains, and that any additional expense that might be incurred by some of the inspection departments would be fully justified. Some inspection departments have already adopted this policy and it is believed that the policy warrants national adoption.

The principal reasons for this recommendation are:

(1) A material part of the production of wheat of the classes Hard Red Winter, Hard Red Spring, White, and Durum, contains less than 11 percent moisture. Wheat of relatively low moisture content has special value for blending with tough wheat, especially in those years when a material part of the crop contains excess moisture. Also the dry-matter content of wheat containing 10 percent moisture, for example, is 4 percent greater than that of wheat containing 14 percent moisture, and its value for milling purposes is correspondingly greater. For these reasons, the certification of moisture content in all domestic certificates for wheat should function to bring out premiums for wheat of relatively low moisture content, as well as to establish fair discounts under the proposed special grade Tough for wheat that contains excess moisture.

(2) It is now well recognized in the wheat industry that the accuracy and reliability of protein tests would be increased materially if the moisture content of wheat was given definite consideration in computing the protein content, and there is a demand, therefore, for accurate information on moisture content to meet the commercial requirements for protein testing. The certification of moisture content in all domestic certificates for wheat should serve to facilitate an improvement in protein testing.

(3) Year in and year out, the factor of moisture is the factor of greatest importance in determining the grade of corn. Also the single factor of dry-matter content is of very material significance in the market evaluation of corn, especially for that part of the crop that is utilized by the so-called "corn-products industries". Most of the inspection departments now make moisture determinations on practically all samples during the period November to April of each year while some departments made the test on all samples throughout the year. Some corn markets, also, have established definite schedules of premiums and discounts according to the percentage of moisture. It is believed by the Bureau that a national, uniform policy of certifying the moisture content in all domestic certificates for corn would result in an improvement of inspection uniformity by grade, and would provide a constant, definite basis for premiums and discounts according to the moisture or dry-matter content. Such a policy should develop premiums for corn of low moisture content. The premium value in low-moisture corn may be overlooked when such corn is merely graded No.3, for example, but with no statement made of the moisture content.

MUSTY AND SOUR GRAIN

All musty, slightly sour, or very sour grain, which is out-of-condition grain, would be graded Sample grade under the proposed standards, whereas under the present official standards for wheat, rye, oats, corn, and grain sorghums, one or more of these qualities is permitted by the specifications for the lowest numerical grade.

According to averages determined from inspection data covering supervised receipts of wheat for the entire United States for the 9-year period, 1923–24 to 1931–32, inclusive, and of grain sorghums for the 6-year period, 1926–27 to 1931–32, inclusive, this change in the methods for grading musty and sour grain would increase the volume

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of Sample grade Hard Red Winter wheat by about 3 percent, Soft Red Winter wheat by about 2 percent, Hard Red Spring wheat by about 0.4 percent, and grain sorghums by about 5 percent. In all probability, these percentages are greater than the true average for these crops because they were determined largely from appeal-inspection data and because appeals called on this factor do not always represent the average quality of the crops.

The factors of musty and sour have been of relatively small importance in the grading of durum wheat, white wheat, and corn. Although, for oats and rye, no data on this subject are available for a period of years, it is known from observation and experience that the factor of sourness has not been a factor of importance in the grading of these crops. A study of inspection data shows also that in case of hard red winter wheat, soft red winter wheat, hard red spring wheat, and grain sorghums, the percentages of receipts that were musty or sour subsequent to 1928 were less than the average percentages above given. The peak period during the last decade in the marketing of musty and sour grain came during 1926, 1927, and 1928, during which period the combine-harvester was introduced widely in many grain-producing areas where producers were unfamiliar with its use.

Numerical Grades Should Not Include Unsound Grain

Some producers and country shippers of grain may conclude, offhand, that this proposed revision would be harmful to their interests because it would result in increased discounts for those shipments that now fall into the lowest numerical grades but that would be graded Sample grade under the proposed standards. Even though these proposed methods for grading musty and sour grain should increase the discounts slightly on the small volume of such shipments, it should be kept in mind that the volume of low-grade grain that is musty or sour is much smaller than the volume of grain that is of low grade for other reasons and that the association of unsound grain with sound grain within the same grade designation undoubtedly discredits the sound grain of that grade when such grain is sold by grade alone. When any grade may comprise either sound or unsound grain, the price level for grain of that grade will be based, to a considerable extent, on the unsound quality that might be present and which represents the lowest quality possible within the grade specifications. This principle is well illustrated in the present official standards for grain sorghums, in which sound, musty, or sour grain may be graded No. 4. In the dry years a material volume of the grain sorghums crop grades No. 4 because of cracked kernels, and such grain is normally sound and otherwise of high grade. Buyers, however, hesitate to bid or contract by grade for grain sorghums of No. 4 grade unless the sample is before them, because of the fear that a delivery under that grade might consist of musty or sour grain. As a consequence the price level for No. 4 grain sorghums is often below that to which the utility value of sound No. 4 grain is entitled.

Normally, the volume of grain graded into the lowest numerical grades of the present official standards on account of mustiness or sourness is distinctly smaller than the volume of grain so graded on account of all factors other than mustiness or sourness. It is more equitable, therefore, to assess Sample grade discounts on the rela-

tively small volume of low-grade grain that is musty or sour than it is to penalize a relatively large volume of sound, low-grade grain by including musty or sour grain in the same grade with sound grain. Thus, the proposal to include all musty and sour grain in Sample grade would favor the majority of producers and shippers, in that it would tend to strengthen the bids for grain of the lowest numerical grade.

Musty and Sour Specifications in Relation to Inspection Efficiency

Another important reason for the proposed inclusion of all musty and sour grain in Sample grade is that inspection experience indicates that it is often a practical impossibility for grain inspectors to differentiate accurately between musty oats (grade No. 4) and sour oats (Sample grade), or between musty wheat (grade No. 5) and very sour wheat (Sample grade), or between slightly sour wheat (grade No. 5) and very sour wheat (Sample grade). Under existing methods of grain inspection all such differentiations must be determined by the inspector's sense of smell, and it is difficult, therefore, to make a uniform application of such grade specifications in many markets because of human variability in the sense of smell. The application of musty and sour specifications would be simplified materially by making any recognizable degree of either mustiness or sourness a cause for Sample grade. An increase in intermarket uniformity of grading should result.

Musty or Sour Grain Has Relatively Low Utility Value

Another important reason for the proposed inclusion of all musty and sour grain in Sample grade is that the development of a musty or sour condition in any grain permanently injures its value for the manufacture of food products, because the fetid odor, or the acidity, or the rancidity, associated with such damage, carries through to the finished products and is strongly objected to, therefore, by millers, bakers, and other grain processors. The facts that mustiness and sourness commonly develop concurrently in grain, that rancidity may be and often is associated with mustiness as well as with sourness, and that differentiations between mustiness and sourness, or between slightly sour and very sour, may be inaccurate according to the human sense of smell, place musty and sour grain in the same market-value category in most cases, although in sample trading the discounts are sometimes more severe for outstanding cases of very sour grain than for slightly musty grain.

OBJECTIONABLE MIXING

Unnatural Material

The proposed standards for wheat, rye, oats, barley, corn, and grains sorghums, include special grades, for Unnatural Material, which grades, when applicable, would be included in and made a part of the complete grade designations for these kinds of grain in a manner similar, for example, to that of the special grade Garlicky in the present official wheat standards.

PROPOSED DEFINITION AND APPLICATION OF FACTOR "UNNATURAL MATERIAL"

Unnatural material is defined in the proposed standards for wheat, for example, as follows:

> Unnatural Material shall be kernels and pieces of kernels of corn, grain sorghums, nongrain sorghums, and soybeans, and other matter except wheat not grown naturally with wheat. Unnatural Material shall not include sand, dirt, stones, and cinders.

Definitions, similar in principle but varying as to the materials constituting unnatural material, are given as a part of the proposed standards for rye, oats, barley, corn, and grain sorghums.

These special grades for unnatural material would be applicable to wheat and rye containing a quantity of unnatural material in excess of 0.3 percent, and to oats, barley, corn, and grain sorghums containing a quantity of such material in excess of 0.5 percent. For all grain that might be graded under the provisions of these special grades for unnatural material, inspectors would be required by regulation also, to state under Remarks, in all certificates issued by them, excluding those issued for export shipments, the words "Unnatural Material", followed by the name of the kind or kinds and by a percentage statement of the total quantity thereof.

In inspection procedure, the determination of percentage quantities of unnatural material would be by weight on the basis of grain including all dockage and foreign material. In the application of the grade factor, foreign material, and in the determination and assessment of dockage, unnatural material, would function as a part of the total foreign material in the nondockage grains of the proposed standards (corn and oats), and as a part of the total foreign material and/or as a part of the dockage material, as the case might be, in the dockage grains of the proposed standards (wheat, rye, barley, and grain sorghums).

For example, should a lot of wheat of the subclass Hard Winter, contain 0.5 percent whole corn kernels (unnatural material), 2.5 percent rye (foreign material), and 1.5 percent small, separable weed seeds (dockage), and be otherwise of No. 1 grade quality, the grade, according to the proposed standards, would be "No. 3 Hard Winter, Unnatural Material, Dockage 2 percent", supplemented by the notation under Remarks of the words "Unnatural Material—corn 0.5 percent." In this example, the numerical grade was determined from the factor of foreign material (rye 2.5 percent), the special grade "Unnatural Material" was determined and included in the complete grade designation because of the factor unnatural material (corn kernels more than 0.3 percent), and the dockage assessment was calculated from the quantity of separable foreign material that passed through the dockage sieve (small weed seeds 1.5 percent) together with the quantity that remained on the scalper sieve (corn kernels 0.5 percent), making a total of 2 percent dockage.

EFFECT OF SPECIAL GRADE "UNNATURAL MATERIAL" ON CONTRACT DELIVERIES

Whenever, under the proposed standards, wheat, rye, oats, barley, corn, or grain sorghums contain a sufficient quantity of unnatural material to cause the special grade for unnatural material to be assigned and made a part of the complete grade designation, the special grade would function to label such grain as grain containing unnat-

ural material and to thereby prevent its delivery in fulfillment of contracts based on unqualified numerical grade designations.

The principal reasons for these proposed methods for the special designation of grain containing unnatural material are given in succeeding paragraphs.

TOLERANCE FOR "OTHER GRAINS" IN OFFICIAL STANDARDS

It is obvious that some mixtures of grain are the natural result of production conditions on the farm whereas others are entirely unnatural on the farm. Wheat containing rye or oats, and barley containing wheat or oats, are usually natural mixtures although they may be created artificially. On the other hand, wheat containing corn or grain sorghums, corn containing oats, and barley containing corn, are entirely unnatural mixtures in normal grain production. They arise in grain commerce either through premeditated mixing operations or through careless elevator management.

The official grain standards all permit small tolerances for other kinds of grain in the top grades for any given kind of grain for which standards have been established. These tolerances were intended to cover the natural mixtures incidental to grain production and handling. The limitations were so formulated as to allow maximum quantities of other grains in the chief commercial grades for each kind of grain that would not lower appreciably either the feed value of grain or the value of the products manufactured from grain, yet they were not made so rigid as to penalize the grade of country-run grain which might contain the small admixtures of other kinds of grain that are incidental to the production and handling of grain on the farm. In large degree these tolerances in the grain standards that pertain to "other grains" have functioned in accordance with the original intent of the standards to have such tolerances cover natural mixtures only. This interpretation of these tolerances is effective in major degree because the greater and better part of the grain trade does not seek its profits through the creating of unnatural mixtures, and because of the restrictions that are imposed on grain adulteration by the provisions of the United States Food and Drugs Act.

UNNATURAL MIXTURES OBJECTIONABLE TO GRAIN USERS

Nevertheless, because of the distinct price differentials at times between different kinds of grain, there is an inducement to make a profit from those mixing operations that create objectionable unnatural mixtures under the tolerances for other grains in the standards. In relatively minor degree, therefore, such objectionable mixing is done and the mixer often escapes detection. Two illustrations of the possibilities for such mixing under the specifications of the present official standards are given in succeeding paragraphs.

The present official standards for hard red winter wheat allow 2 percent of "other grains" in grade No. 2 when no "matter other than cereal grain" is present, and, in the application of the dockage factor, the wheat may contain also 0.9 percent dockage material without assessment. According to the definitions for "foreign material other than dockage" and for "dockage" in the official standards, such material as corn kernels, or cracked corn, or grain sorghums, may be includ-

ed in these tolerances for foreign material and dockage, which, in grade No. 2, could amount to a total of 2.9 percent in wheat not assessed for dockage. Wheat, however, usually contains at least 0.2 or 0.3 per cent natural dockage and an approximately similar quantity of natural foreign material other than dockage, so that there is usually a possibility under the present official standards of mixing about 0.6 percent unnatural foreign material of a dockage character together with about 1.7 percent unnatural foreign material other than dockage or a total of about 2.3 percent unnatural material, into No. 2 wheat without penalty as to either grade or dockage. Whole kernels of corn and the very small and very large pieces of cracked corn resulting from artificial drying and handling of corn function as dockage in wheat, while grain sorghums and medium-sized pieces of cracked corn usually remain with the wheat in screening operations and so function as "foreign material other than dockage."

Thus, intermittently, car lots or cargoes of No. 2 Hard Winter wheat move in both domestic and foreign commerce which contain 0.5 to 0.7 percent whole corn or cracked corn as unassessed dockage, or 1 to 1.5 percent of grain sorghums or medium-sized pieces of cracked corn as foreign material other than dockage. Such matter, passing as wheat, gives the wheat an unattractive general appearance, causes millers an expense for removing the separable portion, and causes small milling losses if inseparable. Domestic grain users, therefore, have justification for their objections to such mixing, and when an occasional export cargo of wheat contains these unnatural mixtures, the complaints of the foreign millers are so severe as to seriously injure the reputation of United States wheat, the reliability of our grain standards, or the commercial reputation of the port of export. One such export cargo will do more damage to the reputation of United States wheat abroad than many good deliveries can do to establish a good reputation.

A second illustration of the occasional unnatural mixtures that are made under the tolerances of the present official standards may be had in the standards for corn. One of the important contract grades for corn, namely No. 3, may contain maximum content of 4 percent foreign material and cracked corn. The definition for "foreign material and cracked corn" in the official standards comprises—

> cracked corn and all matter other than corn which will pass through a metal sieve perforated with round holes twelve sixty-fourths of an inch in diameter, and all matter other than corn remaining on such sieve after screening.

In inspection procedure, oats, grain sorghums, and wheat are classified, therefore, as foreign material in corn. Thus, when oats are distinctly cheaper than corn, as much as 4 percent of low-grade oats may be and sometimes has been mixed into No. 3 corn within the grade limitation for foreign material. Even wheat has been mixed into corn in recent years when corn was priced higher than wheat.

Although these unnatural mixtures in corn may not affect materially the value of corn for direct use as livestock feed, they are a nuisance and an expense to corn millers and corn-products manufacturers. Buyers who bid for No. 2 or No. 3 corn are entitled to deliveries of corn containing natural foreign material only. The unnatural mixtures serve no useful purpose and they are objectionable to buyers and users of corn.

SPECIAL GRADES FOR "UNNATURAL MATERIAL" WOULD CURB UNNATURAL MIXTURES

Although the Bureau realizes that the creation of such unnatural mixtures by premeditated mixing operations as those above described, is not a widespread practice in grain commerce, it believes that a curbing of these uneconomic and unethical practices, which do crop out at times in the grain trade, by means of restrictions in the official grain standards would be of benefit to grain producers and users and would be of assistance in establishing a good reputation for United States grain and the United States grain standards in foreign countries. An effective curb would be placed on these undesirable mixing operations by the proposed special grades for Unnatural Material, by means of which all lots of wheat and rye containing more than 0.3 percent unnatural material, and all lots of oats, barley, corn, and grain sorghums, containing more than 0.5 percent of such material, would be so labeled in the grade designation as to indicate the presence of unnatural material in the grain.

The proposed maximum limitation for unnatural material in the straight numerical grades for oats, barley, corn, and grain sorghums, is one and two thirds times as great as that for wheat and rye because (1) in the so-called feed grains the mixtures of other grains are not as injurious to utility value as in case of the mill grains, wheat and rye, (2) in inspection procedure a small percentage of unnatural material in the feed grains is more difficult to observe and determine than in case of the mill grains, and (3) because the hazards in mixing one kind of grain with another during elevator storage and handling are probably greater with feed grains than with the so-called mill grains. For both mill grains and feed grains it is believed that the proposed tolerances of 0.3 and 0.5 percent unnatural material, respectively, for the straight numerical grades, are ample to cover the normal hazards of grain handling through elevator bins which might cause the presence of unnatural material in any given kind of grain. In the majority of cases the presence of unnatural material in quantities greater than these tolerances is the result of premeditated mixing, and, in the rare instances when not so, it is the result of careless elevator management.

Relation of Proposed Grades to Food and Drugs Act

The proposed specifications for unnatural material should not be considered as a permission under the United States Grain Standards Act to adulterate wheat with a maximum of 0.3 percent, or with any amount, of unnatural material, or oats with a maximum of 0.5 percent, or with any amount, of such material, in violation of the letter and spirit of the United States Food and Drugs Act. The proposed specifications, if made a part of the official grain standards of the United States, would in no wise excuse the failure of any individual to comply with the provisions of the Food and Drugs Act. They would merely serve, independent of that act, to cause the special grade Unnatural Material to be assigned to wheat, for example, containing more than 0.3 percent corn or other kind of unnatural material, but they would not function to abrogate liability for grain adulteration under the Food and Drugs Act.

Special Limitations on Durum and Red Durum

Inspection experience has shown that the special limitations of 2, 5, and 10 percent of durum for grades 1, 2, and 3, respectively, in the present official standards for Hard Red Spring and Hard Red Winter wheat, and of 2, 3, and 10 percent of durum for grades 1, 2, and 3, respectively, in the present official standards for Soft Red Winter and White wheat, are greater than necessary to provide for the natural mixtures of durum in these classes of wheat. According to inspection data covering supervised receipts of wheat for the entire United States for the 9-year period 1923–24 to 1932–33, inclusive, no White wheat receipts were graded lower than No. 1 because of the grade factor durum, and the percentages of receipts of the other classes of wheat that graded lower than No. 1 because of this factor were as follows: Soft Red Winter, 0.03 percent; Hard Red Winter, 0.3 percent; and Hard Red Spring, 1.7 percent.

As a result of these unnecessarily wide tolerances for durum wheat in the various classes of wheat other than durum, the mixing of durum wheat, especially Red Durum, into elevator stocks and export deliveries of Hard Red Winter, Hard Red Spring, and occasionally Soft Red Winter wheat, is practiced at times, whenever price differentials between the two kinds of wheat make such mixing profitable. A 5-percent admixture of Red Durum in Hard Red Winter wheat of the contract grade No. 2 Hard Winter is especially objectionable to domestic millers and foreign buyers of United States wheat. Similarly, the 5-percent admixture of durum or Red Durum in No. 2 Northern Spring wheat, and the 10-percent admixture of durum or Red Durum in No. 3 Hard Winter wheat, permitted by the present official standards, have contributed to make millers reluctant to accept wheat of these grades on futures contracts, thus tending to widen the discounts on wheat of these grades.

For these reasons, it is recommended in the proposed standards to restrict the special limitations on durum in the class Hard Red Spring to 2, 3, and 5 percent in grades 1, 2, and 3, respectively; and in the classes Hard Red Winter, Soft Red Winter, and White to 0.5, 1, and 2 percent in grades 1, 2, and 3, respectively.

Another form of objectionable mixing is practiced under the present official standards for durum wheat whereby Red Durum is mixed into durum wheat. The present official standards for durum wheat contain a special limitation of 5 percent Red Durum in the grades No. 1 Amber Durum and No. 1 Durum, but in all the other grades for common durum, including the important contract grade of No. 2 Amber Durum, the maximum limitation on Red Durum is 10 percent. Such quantities of Red Durum in common durum wheat are objected to strongly by the millers of semolina flour, and are an important factor in causing durum wheat of the contract grades to be undesirable for millers under futures delivery contracts.

Although the Bureau has no data available to indicate the exact percentage of the country-run receipts of durum wheat of the present official subclasses Amber Durum and Durum which contain more than 5 percent of Red Durum, the Federal grain supervisors at the important durum wheat markets estimate that such mixtures probably do not comprise more than 3 or 4 percent of the country-run receipts. The natural mixtures of common durum which contain more than

5 percent Red Durum do not comprise a material segment of the durum wheat production, and, where they do occur, they are caused largely by the use of impure seed, the remedy for which is in the hands of the producers themselves. But in spite of the fact that only a small segment of the durum wheat crop contains mixtures of more than 5 percent Red Durum, a large proportion of the elevator deliveries of durum wheat of the important contract grades contain anywhere from 5 to 10 percent Red Durum in those years when distinct price differentials exist between the two kinds of wheat.

For these reasons the Bureau believes it to be desirable, for the benefit of both durum wheat producers and consumers, to restrict the limits for Red Durum in the most important contract grades for durum wheat. Accordingly it is recommended in the proposed standards for durum wheat, to restrict the limitation on Red Durum to 3 percent in grade No. 1 of each of the proposed subclasses Amber Durum and Durum, and to 5 percent in grade No. 2 of each of these subclasses.

Damaged and Heat-Damaged Kernels

In the present official standards for rye, the definitions for "damaged kernels" and "heat-damaged kernels" are so written as to make these grade determining factors applicable to all damaged kernels and pieces of kernels of rye and other grains in the sample. The definitions governing the application of these grade factors are not consistent, however, in the present official standards for wheat, corn, oats, rye, barley, and grain sorghums. In the case of wheat, for example, the present official standards make these factors applicable only to kernels and pieces of kernels of wheat. In the case of grain sorghums, as another example, the factor of damaged kernels is made applicable only to kernels of grain sorghums, whereas the factor of heat-damaged kernels is made applicable to kernels of grain sorghums and other grains.

The Bureau believes that the policy established in the rye standards for the application of these grade factors is the policy that is correct in principle; thus, in the proposed standards for all kinds of grain, specifications for damaged kernels and heat-damaged kernels are proposed which would make these factors applicable to the kernels of each standardized kind of grain as well as to the kernels of other grains that may be mixed in the sample.

The principal reason for this proposed revision is that of providing specifications in the standards that would function as a curb on the occasional objectionable mixing of small quantities of damaged grain of one kind with sound grain or another kind. The effect of this revision may be well illustrated with the wheat standards. In the case of the important contract grade of No. 2 Hard Winter, for example, a maximum quantity of 2 percent rye may be and often is mixed into the wheat when no "matter other than cereal grains" is present. Such rye, under the present official standards, may be either damaged or heat damaged because the factors of "damage" and "heat damage" are applicable only to the kernels of wheat. Under the proposed standards, these factors would apply to both the wheat and rye kernels, so that when damaged rye is mixed into wheat the percentage of damaged rye kernels would be added to the percentage of naturally damaged wheat kernels, thus tending to lower the grade of the entire

lot of wheat on the factor of damaged kernels. The hazards in such objectionable mixing thereby would be increased materially.

Other Revisions Pertaining to Objectionable Mixing

The proposed standards for barley provide for the grading of eastern barley as well as western barley on a dockage basis. Dockage, as proposed for the class Barley (eastern barley), would consist principally of fine seed material that may be removed easily by screening. With all classes of barley graded on a dockage basis it would be unprofitable for anyone to mix into barley, within the grade limitations for foreign material, the fine seed material screened out of wheat or other grains. The adoption of the dockage system for all classes of barley would function, therefore, to curtail any objectionable and uneconomic mixing of this character.

CORN STANDARDS

In the proposed standards for corn it is recommended that five numerical grades and Sample grade be specified in lieu of the six numerical grades and Sample grade specified in the present official standards; that musty and sour corn be included in Sample grade, whereas the present official standards permit such grain in grade No. 6; that the size of the perforations in the sieve for the determination of the factor "foreign material and cracked corn" be reduced to a diameter of ten sixty-fourths of an inch from a diameter of twelve sixty-fourths of an inch as specified in the present official standards; and that a special grade for unnatural material be included in and made a part of the complete grade designation when unnatural material is present in corn in a quantity that is in excess of 0.5 percent by weight. Unnatural material would be defined as kernels of wheat, rye, barley, oats, grain sorghums, nongrain sorghums, soybeans, and other matter except corn not grown naturally with corn.

The principal reasons for the proposed revisions pertaining to the grading of corn that contains unnatural material and to the grading of musty and sour corn are given in the chapters of this report entitled "Objectionable Mixing" and "Musty and Sour Grain". The principal reasons for the other proposed revisions of the corn standards are given in succeeding paragraphs.

Demand for Five Numerical Grades

Although the present official standards for corn have proven generally satisfactory and have not been subject to serious criticism, the definite opinion prevails in most of the inspection departments in the important corn markets that corn standards based on five numerical grades and Sample grade would be preferable to the present official standards which are based on six numerical grades and Sample grade.

One reason for this opinion is that, prior to the promulgation of Federal standards, most of the market corn was inspected under standards based on four numerical grades and Sample grade. Thus, an increase in the number of numerical grades from 4 to 6 has been considered unnecessary by many inspectors and grain dealers. Others believe that there is little or no justification for six numerical grades for corn, when the official standards provide but five numerical

grades for wheat, and that a reduction in the number of numerical grades for corn would facilitate the market movement and handling of corn in that it would simplify inspection, handling, and binning problems, especially at country elevators.

Probably the most important reason advanced for a reduction in the number of corn grades is that, under the six numerical grade system, the intervals between the specifications for the factor "total damaged corn" for the respective grades are so narrow as to make these specifications difficult to apply accurately by corn buyers at country points and even by licensed inspectors. Another aspect of this reason is that damaged kernels (other than heat damage) in dry corn do not lower its utility value to the same extent as damaged kernels (other than heat damage) in dry wheat, yet in the present official wheat standards the damaged kernel specifications for grades 3, 4, and 5, are noticeably more liberal than the damaged kernel specifications for the equivalent grades of the present official corn standards. Many people believe, therefore, that the specifications for the grade factor "total damaged corn" should be liberalized in the corn standards, and, furthermore, that the six divisions of quality in corn according to this factor serve no useful purpose in corn marketing but exert a tendency to increase discounts.

Distribution of Corn Receipts by Grade Under Present Official Standards

In examining the possibilities for reducing the number of corn grades in a manner that would meet the above-mentioned popular opinions on this subject but that would cause no injustice to any element in the corn industry, it is well to have in mind the percentages of the market receipts of corn that have fallen into the six numerical grades and Sample grade of the present official standards since they were last revised in 1923. This information is given in table 1.

Table 1.—*Corn receipts by grade: All classes of corn inspected by licensed inspectors at all United States inspection points, 9-year period 1923–24 to 1931–32*

Crop year [1]	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Sample grade
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1923-24	1.0	19.5	36.6	22.7	11.7	5.0	3.5
1924-25	3.3	33.6	23.5	14.3	13.0	7.2	5.1
1925-26	1.1	20.2	21.1	17.2	16.3	13.5	10.6
1926-27	.5	12.8	21.5	17.9	18.6	17.1	11.6
1927-28	3.1	27.9	24.9	15.2	11.0	8.7	9.2
1928-29	7.5	26.9	21.4	27.2	11.9	3.0	2.1
1929-30	9.2	29.5	17.3	17.7	13.9	6.7	5.7
1930-31	8.0	30.0	31.4	20.1	6.5	2.3	1.7
1931-32	6.6	35.5	33.0	16.8	3.1	2.8	2.1
Average	5.0	26.2	25.6	18.8	11.7	7.4	5.7

[1] Beginning Nov. 1.

The data in table 1 for the 9-year period show, for the average corn crop, that approximately 5 percent of the market receipts have graded No. 1, that approximately 57 percent of the receipts fell into grades Nos. 1, 2, and 3, combined, and that approximately 76 percent fell into grades No. 1, 2, 3, and 4, combined, under the present official standards.

During the same period, for the average crop of hard red spring wheat, approximately 52 percent of the market receipts fell into grade

No. 1, approximately 88 percent into grades 1, 2, and 3, combined, and approximately 95 percent into grades 1, 2, 3, and 4, combined; and for the average crop of hard red winter wheat, approximately 29 percent of the market receipts fell into grade No. 1, approximately 85 percent into grades 1, 2, and 3, combined, and approximately 91 percent into grades 1, 2, 3, and 4, combined, under the present official standards.

These percentage comparisons between the corn and wheat standards in their coverage of market receipts, illustrate the fact that the grade specifications of the corn standards are relatively strict and that they allow a smaller percentage of the corn receipts to fall into the top grades and cause a larger percentage thereof to fall into the low grades, than in the case of wheat, although wheat is normally a higher priced grain and although wheat buyers usually are more particular in their purchases than corn buyers.

These facts indicate the desirability of readjusting the grade specifications of the corn standards in such a manner as to proportion the market receipts of corn more evenly and fairly among the important contract grades, to the end that a more practical commercial volume of corn in each of these grades may be available for trading purposes than is now available under the present official standards. It is believed that this objective may be attained under a system of five numerical grades, and that the market demands for corn which reflect values for different utility purposes may be covered by five numerical grades as well as by six. If these requirements can be met there is no question but that the 5-numerical grade system would be of advantage in simplifying inspection, handling, and marketing procedure.

Market Demands for Corn

The chief market demands for corn are (1) the demand from corn millers who manufacture corn meal, grits, etc., for human food, (2) the demand from livestock feeders, and (3) the demand from the so-called corn-products industries which manufacture glucose, corn oil, cornstarch, etc. The miller requires a relatively high degree of soundness and a relatively low degree of moisture in his supplies of corn, which qualities are fulfilled by grades No. 1 and No. 2 of the present official standards and at times by grade No. 3 when accompanied by a low-moisture content. The requirements of the buyer who wants corn for livestock feeding are met by any one of the present six numerical grades when accompanied by a relatively low moisture content, although under normal price differentials the bulk of the demand for feed corn is met by corn of the present grades No. 3 and No. 4. The percentage of damaged corn is not of as great significance to the buyer of feed corn as it is to the corn miller. The requirements of the so-called corn-products industries are met by any one of the present six numerical grades, but because of price differentials these industries are normally heavy buyers of corn of the present grades No. 5, No. 6, and Sample grade which permit larger quantities of moisture and of damaged corn than are usually acceptable to corn millers and feeders.

Any set of corn standards to be commercially useful must give consideration to these market demands and must provide grades that will reflect approximately these utility values and market require-

ments. In consideration of this fact, the recommendation made in the proposed standards to substitute five numerical grades for the six numerical grades of the present official standards suggests a comparison of the proposed and official specifications for each grade factor on the basis of their usefulness as measurements of quality that will correlate with market requirements and utility values.

Test Weight Per Bushel

Variations in the test weight per bushel of corn do not correlate with utility values to anywhere near the same extent as they do in the case of wheat in which test weight is important as an index of flour yield. For this reason the grade factor "test weight per bushel" should not be given as much weight in the determination of numerical grade in the corn standards as in the wheat standards. It is desirable in the corn standards to maintain a reasonably high level of quality in grades 1 and 2 according to test weight per bushel, in order to guarantee a good milling quality in corn of the grades most commonly utilized by corn millers. But relatively high test weight per bushel is not an equally important index of the value of corn for use in livestock feeding or for use in the so-called corn-products industries.

Where the buyer contracts for 1,000 bushels of corn, the seller must fulfill the contract with a delivery of 56,000 pounds of corn (legal bushel is 56 pounds). Pound for pound the utility value of high-test-weight corn for livestock feeding or for use in the so-called corn-products industries is usually not considered much, if any, greater than that of low-test-weight corn, with the possible exception of immature corn that is of very low test weight. So far as the utility value of corn for livestock feeding is concerned, feeding tests of high-test-weight and low-test-weight corn have shown sometimes that the low-test-weight corn was of superior value because of its relatively higher protein content.

According to data from the supervised inspections of corn receipts at all United States inspection points for the 9-year period 1923–24 to 1931–32, approximately 19 percent of the market receipts of the average crop of corn had their grade determined as lower than grade No. 1 according to the factor of test weight per bushel under the present official standards. An average of approximately 10 percent of the receipts graded No. 2 (53 to 54.9 pounds), approximately 5 percent graded No. 3 (51 to 52.9 pounds), and approximately 3 percent graded lower than No. 3 (less than 51 pounds).

These data show that an important quantity (about 10 percent) of corn is graded No. 2 under the present official standards on account of test weights that are less than 55 pounds but as great or greater than 53 pounds, and that only a small quantity (about 3 percent) of the market receipts of corn has a test weight per bushel that is less than 51 pounds.

For the reasons given above it is recommended in the proposed standards that the test weight per bushel specification for grade No. 1 be liberalized from 55 pounds to 54 pounds, thus to cause a small increase in the quantity of No. 1 corn. The difference of 1 pound in test weight per bushel would have no material effect on the utility value of corn for milling purposes, and the revision is desirable because it would increase the trading volume of corn that is of distinctly

superior value because it meets all of the other requirements for grade No. 1.

It is further recommended in the proposed standards that no change be made in the present test-weight specifications for grades 2 and 3, but that the present No. 4 grade specification be reduced from 49 pounds to 48 pounds, and that the present 44-pound specification for grade No. 6 be adopted as the test-weight specification for the proposed grade No. 5 which is the lowest numerical grade in the proposed standards. These proposed revisions in grades No. 4 and No. 5 would affect only a small segment of the market receipts of corn as it has been shown above that only about 3 percent of the corn receipts weigh less than 51 pounds per bushel. In occasional cases the effect would be to allow corn which now grades No. 5 to grade No. 4, but in such cases the effect on utility value is practically negligible. The elimination of the test weight requirement of 46 pounds for the present grade No. 5 would have very little or no effect on either grading or marketing procedure, because of the fact that only about 1 percent of the market receipts fall into this test weight range (44 to 49 pounds).

Moisture in Corn

A wider range exists in the moisture content of market corn than in that of any other market grain. This range is commonly from a low of 10 percent to a high of 24 percent. The maximum percentage of moisture in corn to assure safe transportation and storage is approximately the same as in the other grains, namely, about 14 to 15 percent, and varies somewhat with environmental conditions. Corn is harvested and the bulk of it is marketed, however, during weather usually cooler than that prevailing when the small grains are marketed. For that reason shelled corn containing 16 to 18 percent moisture is often transported to the markets or to the livestock-feeding areas without undue risk of heating, although it contains too much moisture for elevator storage. Although the maximum moisture content in corn for safe storage is about 14 to 15 percent, the natural range in the moisture content of market corn makes it necessary to use a wide range of 9 percent (14 to 23 percent) in the grade specifications for moisture in the corn standards as compared with the much narrower ranges for moisture content in the grade specifications for other kinds of grains.

Moisture content is the principal factor in determining the grade of market corn, and is of special significance during the autumn, winter, and early spring months. According to data from the supervised inspection of corn receipts at all United States inspection points for the 9-year period 1923–24 to 1931–32, approximately 55 percent of the market receipts of the average crop of corn had their grade determined as lower than grade No. 1 because of the factor of moisture under the present official standards. An average of approximately 8 percent of these receipts graded No. 2 (14.1 to 15.5 percent moisture), approximately 17 percent graded No. 3 (15.6 to 17.5 per cent moisture), approximately 14 percent graded No. 4 (17.6 to 19.5 percent moisture), and approximately 15 percent graded lower than No. 4 (over 19.5 percent moisture).

Because of the wide range of moisture content in market corn; because such a large volume of corn is de-graded on account of moisture which, at the time of its receipt, is of No. 1 or No. 2 grade other-

wise; because moisture content is an indirect measure of the dry-matter content of corn as well as a direct measure of its condition and storability; and because, for these reasons, moisture content is such an important measure of the utility value of corn, definite price differentials for corn exist in numerous markets that are based on the individual grade factor of moisture as well as on grade. In practically all the corn markets it is now customary to make moisture determinations on all of the corn receipts during the autumn, winter, and early spring months, and to note the percentage of moisture on certificates under Remarks, and in some markets this practice is followed throughout the entire year. Such information, in many cases, is a factor of equal or even greater importance than the grade of corn in the determination of price.

For these reasons it is believed that the moisture specifications of the corn standards might be established on a 5-numerical-grade basis without causing any injury to the producers, shippers, handlers, and consumers of corn. Thus, in the proposed standards, it is proposed to retain the present official-grade moisture requirements for grade No. 1 (14 percent), and the cut-off between the numerical grades and Sample grade (23 percent), and to divide the total range of 9-percent moisture in the numerical grades into 2-percent intervals between grades with the one exception of the interval between the proposed grades No. 4 and No. 5 which would be 3 percent. This proposed revision would add 0.5 percent to the maximum moisture content permitted in grades No. 2, No. 3, and No. 4, but, as a matter of fact, would have but little effect on commercial practices in the marketing of corn, because of the fact that the maximum moisture content now permitted in the official standards for grades 2, 3, and 4, namely, 15.5, 17.5, and 19.5 percent, respectively, are well known to exceed the limits for safe storage of corn, and because of the importance now attached, in commercial practice, to the actual moisture determinations that are recorded under Remarks.

In one respect the proposed standards and the certification regulations proposed to accompany them would constitute a definite improvement over the present official standards and certification regulations, in that a certification regulation that would require all inspectors to embody under Remarks in all certificates issued for corn, except those issued for export shipments, a statement of the actual percentage of moisture for every lot of corn, is proposed in conjunction with the proposed standards. Thus, during all seasons of the year, many lots of corn that grade lower than No. 2 (principal contract grade) because of such factors as damaged corn and test weight per bushel, but that have a relatively low moisture content, would have the superior utility value of such corn according to moisture content emphasized on the certificate. This mandatory certification policy should tend to bring out the full value of many lots of low-grade corn because of the commercial importance attached to the factor of moisture content.

Cracked Corn and Foreign Material

Very few lots of corn are graded below No. 1 because of foreign material, but cracked corn, especially in artificially dried corn, is of some importance as a grading factor. Cracked corn and foreign ma-

terial in combination, however, are of small importance in the grading of the corn crops when compared with the important factors moisture, damaged corn, and test weight per bushel.

According to data from the supervised inspections of corn receipts at all United States inspection points for the 9-year period 1923–24 to 1931–32, about 3.2 percent of the market receipts of the average crop of corn had their grade determined as lower than grade No. 1 because of the factor "foreign material and cracked corn", under the present official standards. An average of only about 1.1 percent of the receipts graded lower than No. 3 on account of this factor.

In the intermarket shipments of old corn that has been in storage, or of artificially dried corn, however, occasional lots or cargoes of such corn are so dry and brittle as to crack up considerably during handling and transferring through elevators, thus causing the grade to be lowered 1 or 2 grades when a new inspection is made under the present official standards. Principally for this reason there has been a considerable demand from the corn industry in recent years for a liberalization of the grade requirements for this factor.

In consideration of the fact that wheat is utilized largely by millers whose processes are relatively technical, and that the wheat standards permit 10 percent of cracked kernels in any numerical grade, the present maximum limitations for foreign material and cracked corn in the corn standards of 2, 3, 4, 5, 6, and 7 percent for grades 1, 2, 3, 4, 5, and 6, respectively, appear unnecessarily strict. Although the percentage of cracked kernels in a lot of corn is of some importance to the corn miller, it has but little significance in determining the utility value of corn for the so-called corn industries and practically no significance to the livestock feeder.

For these reasons the recommendation is made, in the proposed standards for corn, to liberalize the grade requirements for this factor by reducing the size of the perforations in the sieve specified for determining the percentage of foreign material and cracked corn from twelve sixty-fourths of an inch to ten sixty-fourths of an inch, thus reducing slightly the quantity of pieces of kernels that pass through the sieve to function as cracked corn.

This proposed revision of the corn standards would not lower materially the quality of corn in the important contract grades No. 1, No. 2, and No. 3, in which the factor of cracked corn and foreign material is of some significance. The proposed 10/64-inch sieve, however, would occasionally prevent the de-grading, under a new inspection, of a lot of dry corn that had been cracked considerably in rehandling through an elevator since its first inspection.

Some opposition to this proposed revision may be forthcoming on the grounds that any liberalization of the tolerances for cracked corn would increase the hazards of storage because cracked corn is more likely to heat than whole corn kernels. So far as the Bureau knows there is no experimental evidence to indicate that the proposed slight liberalization of these grade limitations for cracked corn would increase the hazards from heating in corn. Furthermore corn which contains so much moisture as to be a storage hazard from heating is relatively tough and usually free from cracked corn—it is the very dry corn which usually cracks up in handling.

Total Damaged Corn

For the purposes of the corn miller, the utility value of corn is lowered by the presence of any material quantity of damaged kernels caused by frost, weather, and mold damage. The volume of market corn utilized for milling is small, however, compared with the large volume utilized by the livestock-feeding industries and by the so-called corn-products industries which manufacture glucose, cornstarch, corn oil, etc., and in which the utility value of corn is not materially injured by the presence of 10 to 15 percent of damaged kernels (other than heat damage). The so-called corn industries utilize approximately 20 percent of the inspected market receipts of corn, or from about 75 million to 85 million bushels annually, and it is a well-known fact that these industries are the chief consumers of that part of the market corn which grades No. 5, No. 6, and Sample grade, under the present official standards, because of the factor, "total damage", and which, therefore, contains anywhere from 8.1 to 15 percent or more of damaged kernels.

The maximum limitations for the grade factor, "total damage", appear unnecessarily strict in the present official corn standards. The present limitations of 2, 4, 6, 8, 10, and 15 percent, for grades 1, 2, 3, 4, 5, and 6, respectively, are stricter than the limitations for total damage in the present official wheat standards which are on the basis of 2, 4, 7, 10, and 15 percent, for grades 1, 2, 3, 4, and 5, respectively, although damaged kernels in wheat are usually considered more objectionable than in corn.

Furthermore, in order to obtain a reasonable degree of accuracy and uniformity in the inspection of corn, the interpretation of total damage must be so made as to include all degrees of damage by the elements or by mold fungi. Inspection efficiency would be difficult to maintain were inspectors required to make a distinction between kernels that are only slightly damaged and those that are materially damaged. Thus, in many cases, under a comprehensive interpretation of total damage, many of the damaged corn kernels may be only slightly damaged externally while the internal portions of such kernels are undamaged and practically equal to fully sound kernels for all purposes with the possible exception of milling.

For these principal reasons the recommendation is made in the proposed corn standards to liberalize the maximum limitation for the factor, total damage, in grade No. 1 from 2 percent to 3 percent, in grade No. 2 from 4 percent to 5 percent, in grade No. 3 from 6 percent to 8 percent, in grade No. 4 from 8 percent to 12 percent, and then, with grade No. 6 eliminated, to specify a maximum limitation of 16 percent for the proposed grade No. 5.

These proposed revisions would cause a small increase of 1 percent in the quantity of total damage permitted in each of the grades No. 1 and No. 2, thus affecting in minor degree only those numerical grades that represent the general quality of corn usually required by the corn millers. The increase of 2 percent in the proposed total damage limitations in grade No. 3 would permit a small increase in the volume of corn grading No. 3 without causing any material change in the utility value of such corn for feeding purposes, and, although the utility value of such corn would be reduced for milling purposes, it should

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be kept in mind that corn millers are not usually important buyers of No. 3 corn. The increase of 4 percent total damage in grade No. 4 would permit some of the corn which now grades No. 5 on this factor to fall into grade No. 4 where its relative value for feed purposes is designated more equitably than by grade No. 5. With grade No. 6 eliminated, and with a maximum limitation of 16 percent total damage specified for the proposed grade No. 5 in lieu of the maximum limitation of 15 percent for the present official grade No. 6, no material change would be effected in the cut-off between the numerical grades and Sample grade, although this proposed revision would allow a small quantity of market corn that now falls into Sample grade to stay within the numerical grades.

These proposed revisions of grades No. 3 and No. 4, with respect to the factor total damage, and the elimination of grade No. 6, would not materially affect the market practices with respect to corn that is not good enough to meet the requirements of grade No. 2, because, under existing market practices, that segment of the corn receipts which contains too much damage to fulfill the requirements of the corn millers is utilized by feeders and the so-called corn-products industries, in which industries a very fine differentiation of corn according to the percentage of total damaged kernels is not made by buyers.

The importance of total damage as a factor in determining the grade of market corn is exceeded only by that of the factor "moisture." According to data from the supervised inspections of corn receipts at all United States inspection points for the 9-year period 1923–24 to 1931–32, approximately 33 percent of the market receipts of the average crop of corn had their grade determined as lower than grade No. 1 because of the factor of total damage under the present official standards. An average of approximately 12 percent of these receipts graded No. 2 (2.1 to 4 percent damage), approximately 8 percent graded No. 3 (4.1 to 6 percent damage), approximately 5 percent graded No. 4 (6.1 to 8 percent damage), and approximately 8 percent graded lower than No. 4 (over 8 percent damage).

These data show that for the average crop of corn about 20 percent of the market receipts contain total damage from 2.1 to 6 percent and about 13 percent of the receipts contain total damage in excess of 6 percent. For that portion of country-run corn which has its grade determined on the single factor of total damage, the proposed revisions of the grade limitations on this factor would function occasionally to raise the grade of the corn one grade for those lots which contain total damage in amounts from 2.1 to 6 percent, and would raise the grade of corn one grade for every lot of corn containing total damage in amounts in excess of 6 percent.

Heat-Damaged Kernels

Although heat damage is probably no more prevalent in corn than in wheat, and although heat damage certainly does not injure the utility value of corn more than it does that of wheat, the present official corn standards are very much stricter than those for wheat in their grade requirements for heat-damaged kernels, permitting, as they do, no heat damage in grade No. 1, only half as much as wheat in grade No. 2, three fifths as much in grade No. 3, one half as much in grade No. 4, and only one third as much in grade No. 5.

Because the specifications for heat damage in the wheat standards have proven generally satisfactory to the grain industry, because such specifications are more practicable of application than the heat-damage specifications of the corn standards, and because there is no known commercial necessity for heat-damage specifications that are more strict in the corn standards than those in the wheat standards, it is considered desirable to liberalize these specifications in the corn standards. This revision wherein the grade requirements for heat-damaged kernels are made the same as for wheat, namely: Grade No. 1, 0.1 percent, No. 2, 0.2 percent, No. 3, 0.5 percent, No. 4, 1.0 percent, and No. 5, 3.0 percent, is recommended in the proposed corn standards.

Conclusions Concerning Five Numerical Grades

From the statements previously made with respect to each of the five grade factors and their individual effect on the grading of the corn crops when embodied in either a 6- or a 5-numerical grade system of corn standards, the following summarized conclusions may be made:

(1) The proposed standards, based on a 5-numerical grade system, would proportion the market receipts of corn among the chief commercial grades more equally for trading purposes than under the present official standards.

(2) The volume of country-run corn that would fall into the so-called contract grades No. 1, No. 2, and No. 3, combined, would be but slightly increased by the proposed standards, and the quality of the corn represented by each of these important commercial grades would be practically the same as under the present official standards, although in the case of grades No. 2 and No. 3 the minimum quality of corn would be lowered slightly by the proposed increases of 1 and 2 percent, respectively, in the maximum limitation of total damaged kernels.

(3) The transferring of musty and sour corn to Sample grade would cause the general level of quality in the proposed grade No. 5 to be superior to that in the present official grade No. 6, and this should tend to strengthen the price for corn of the lowest numerical grade.

(4) The proposed five numerical grades would provide approximate, relative differentiations in the quality of corn which, for commercial purposes, would correlate with the market demands for, and utility values in, corn for milling, livestock feeding, and corn-products manufacturing purposes.

(5) Moisture and total damage are the two most important factors in determining the grade as well as the market value of corn. The market evaluation of corn, according to these important factors, should be as equitable under the proposed 5-numerical grade system as under the present 6-numerical grade system, because such revisions as are proposed in the grade requirements for these factors in grades No. 1, No. 2, and No. 3, would not cause any material change in the quality of corn represented by these important commercial grades, and because in the case of corn that grades lower than No. 3, the individual factors of moisture and total damage are of greater significance in the determination of market value than the grade.

(6) The proposed five numerical grades would be more practical for application by country corn buyers and by inspectors than six numerical grades, and should, therefore, increase the usefulness of the

corn standards and improve intermarket uniformity in the grading of corn.

GRAIN SORGHUMS STANDARDS

Experience had during a period of 8 years indicates a number of revisions in the grain sorghums standards that should improve their usefulness and efficiency. The principal proposed revisions are: (1) Simplification of the classes and subclasses, (2) elimination of the grade factor "general appearance" and the substitution therefor of special grades for Bright and Stained, (3) elimination of the grade factor "total other grains" but retention of the present official grade specifications for nongrain sorghums, (4) elimination of the grade factor "sand, dirt, and finely broken kernels" and the substitution therefor of a dockage system, (5) increases in the maximum limitations of "cracked kernels and foreign material" from 3, 6, and 10 percent, to 4, 8, and 12 percent, in grades 1, 2, and 3, respectively, (6) elimination of the "musty and sour" specifications in grade No. 4 and their inclusion in Sample grade, and (7) the adoption of a special grade for Unnatural Material, applicable to all grain sorghums containing more than 0.5 percent of matter not grown naturally with grain sorghums.

Among these proposed revisions, the subjects of general appearance, musty and sour grain, and unnatural material, are explained in detail in the chapters of this report entitled "General Appearance Factor—Oats, Feed Oats, Mixed Feed Oats, Barley, and Grain Sorghums", "Musty and Sour Grain", and "Objectionable Mixing." All other proposed revisions are discussed in the succeeding paragraphs of this section.

Classification of the Grain Sorghums

The grain sorghums are classified, under the present official standards, on the basis of variety or type. On this basis there are 10 classes, inclusive of Mixed Grain Sorghums, and 6 subclasses. Any hybrid or other new variety not specifically mentioned in the list of official classes is included in the class which it most nearly resembles.

Under the present official standards, the great majority of the market receipts of grain sorghums are classified as kafir and milo. According to data from the original inspections made by licensed inspectors at all United States grain inspection points for the 8-year period 1925–26 to 1932–33, inclusive, the average, annual percentages of the market receipts of grain sorghums by classes and subclasses were approximately as follows:

	Percent	Percent
Class, Kafir		39.7
Subclass, White Kafir	37.4	
Subclass, Kafir	2.4	
Class, Milo		48.0
Subclass, Yellow Milo	46.6	
Subclass, Milo	1.3	
Class, Mixed		11.4
Classes, (Miscellaneous White), Durra, Feterita, Freed Sorgo, and Shallu		.5
Subclass, White Durra	.3	
Feterita, Freed Sorgo, Shallu	.2	
Classes, (Miscellaneous Brown), Darso, Brown Kaoliang, Brown Durra, Schrock Kafir		.4
Total		100.0

Classification by Color Has Been Suggested to the Bureau

It has been suggested to the Bureau that the grain sorghums standards might be improved and simplified if they would provide for the classification of grain sorghums on the basis of color instead of on the basis of variety or type, and in a manner more or less comparable with the present official classification of corn which is accomplished on a color basis. The grain sorghums classes that have been suggested on the basis of color are: White, Yellow, Red, Brown, and Mixed.

Three principal objectives are sought in this color classification, namely: (1) Simplification of the classes, (2) segregation in one class of the brown and often bitter grain sorghums that are usually of lower commercial value than the white, yellow, and red grain sorghums, and (3) provision for the classification of new varieties (usually hybrids), from time to time, according to their color, thus to avoid the necessity of either classifying them with the class that they most nearly resemble (based on variety), or of revising the official standards from time to time in order to establish new classes for such new varieties according to variety or type. Current problems that have arisen with respect to the classification and grading of such new varieties as Wheatland milo, Grohoma, and Chiltex, have been responsible in part for this proposed plan for the classification of the grain sorghums on a color basis only.

Two Classification Plans Submitted by Bureau for Public Consideration

Although the classification of the grain sorghums on a color basis only is logical and would be advantageous in several respects, it has brought forth for determination several problems pertaining to commercial practice and inspection procedure, which are of sufficient importance to cause the Bureau to believe that before reaching a final decision they should be submitted for public consideration by the grain sorghum industry. For this reason, and for the purpose of simplifying the classification of the grain sorghums, the Bureau is submitting two plans for revising the class and subclass specifications of the grain sorghums standards. One of these plans, designated as Plan A, suggests class definitions based partly on type and partly on color, whereas the other one, designated as Plan B, suggests class definitions based on color only. The problems requiring consideration by the grain sorghum industry are outlined in connection with the discussion of each of these plans.

Plan A—Class Definitions Based Partly on Type and Partly on Color

Under plan A there would be five classes of grain sorghums—Kafir, Milo, White, Brown, and Mixed; and seven subclasses—White Kafir, Red Kafir, Kafir, Yellow Milo, Milo, White Durra, and White. The commercially important grain sorghums of the kafir and milo types, which are included in the classes Kafir and Milo of the present official standards and which comprise about 88 percent of the market receipts, would be classified by type or variety just as they are in the present official standards. The subclasses within the proposed Kafir and Milo classes would be the same as in the present official standards except that one new subclass Red Kafir would be established in the

class Kafir in order to differentiate this commercially preferred type of kafir from the miscellaneous types and mixtures of kafir included in the subclass Kafir.

Under this plan those types or varieties of white grain sorghums, such as feterita, white durra, Freed sorgo, and shallu, which are marketed in relatively small volume, would be segregated in one class based on color and entitled White Grain Sorghums. Such new varieties as Chiltex would also come under this classification. Two subclasses, White Durra and White, would be established in this class for the purpose of differentiating the white durra type, which has special commercial significance in the Pacific coast area, from the white grain sorghums of miscellaneous type.

Under this plan all the brown grain sorghums, which usually have a comparatively low commercial value, such as darso, brown kaoliang, brown durra, and Schrock kafir, would be segregated in one class based on color and entitled Brown Grain Sorghums. The new variety Grohoma, for which there is no definite place in the present official standards, would be included in this proposed class for Brown Grain Sorghums.

Provision for the classification of future new varieties under this plan would be made by the same method as that employed in the present official standards, namely: A specification authorizing the classification of any grain sorghum not specifically mentioned in the proposed Classes I to IV with the class that it most nearly resembles.

Inspection procedure under this plan would be based on both type and color. The classification of the commercially important kafirs and milos would be accomplished chiefly by kernel type but with color employed in sub-classification, as in the case of White Kafir and Red Kafir or Yellow Milo and White Milo. The classification of brown grain sorghums would be by color alone, whereas in the case of the miscellaneous white grain sorghums (those white grain sorghums other than white kafir, hegari, and white milo) classification would be based on both type and color—in other words, any white grain sorghum not meeting the type characteristics of the kafir or milo types would be classified as White Grain Sorghums. Within this proposed class, White Grain Sorghums, the subclass White Durra would be applied by type.

With respect to the classification of future new hybrid varieties or types of grain sorghums, this plan would function as follows: If the new variety is brown in color it would fall into the class Brown Grain Sorghums; if white in color and of the kafir type, it would classify as White Kafir; if white in color and of the milo type, it would classify as Milo (subclass Milo); while if white in color and neither kafir, durra, nor milo in type, it would classify with the miscellaneous white grain sorghums in the subclass White of the class White Grain Sorghums. In the case of new varieties that are red in color and of the kafir type, they would fall into the proposed subclass Red Kafir but if red in color and not of the kafir type there would be no definite place in the classification for them. Similarly, in case of new varieties that are yellow in color and of the milo type, they would classify either in the subclass Yellow Milo or the subclass Milo, as the case might be, but if yellow and not of the milo type there would be no definite place for them in this plan of classification. To a large extent, however, and with the exception of possible hybrids

that might be red or yellow in color and of nondescript type, of which types none is of commercial significance at the present time, this plan would take care of new varieties, especially when it is considered that the major part of the grain sorghums production and marketings consists of grain sorghums of the kafir and milo types.

Plan B—Class Definitions Based on Color Only

Under Plan B there would also be but five classes of grain sorghums—White, Yellow, Red, Brown, and Mixed. The class specifications, under this plan, would be based on color only. It would be necessary, under such a color classification, to establish seven subclasses (the same number as in Plan A) in order to (1) preserve the grade terms White Kafir, Yellow Milo, and White Durra, that are of important significance in established commercial practice, (2) establish a subclass for Red Kafir to meet Kansas requirements for the grading of this premium type, and (3) provide for the differentiation of nondescript types of white, yellow, and red grain sorghums from those types of white, yellow, and red grain sorghums that meet the requirements of the premium subclasses White Kafir, White Durra, Red Kafir, and Yellow Milo.

These classification principles may be illustrated with the proposed class White (Plan B) which would include all grain sorghums having white color. Within this class there would be three subclasses—White Kafir, White Durra, and White. White grain sorghums of the kafir or hegari type would be included in the subclass White Kafir; those of white-durra type in the subclass White Durra; while those of nondescript type would be included in the subclass White. Similar principles would prevail in the proposed classes Yellow and Red. In each of the classes White, Yellow, and Red (Plan B), classification would be based on color and subclassification on type. In the class Brown (Plan B), color would be the basis for classification, as it would be also under Plan A.

Inspection procedure under this plan for the commercially important types or varieties white kafir, yellow milo, red kafir, white durra, and white milo, as well as for nondescript white grain sorghums, would be no different under Plan B than under Plan A, as both color and type characteristics would have to be employed under either plan to determine class and subclass. Also inspection procedure for brown grain sorghums would be the same under Plans A and B, as classification in both cases is based principally on color although type characteristics might be of supplementary usefulness.

There have arisen, however, certain problems with reference to the practicability of applying some of the proposed color specifications of Plan B, which should be brought to the attention of the inspection departments in the grain-sorghum markets, and which should be given experimental consideration. The natural colors of some of the grain-sorghum varieties, especially hybrid varieties, are not distinctly white, or yellow, or red, or brown, but are, in fact, composite colors. This problem, in the case of grain sorghums principally white in color but spotted with other colors is unimportant, as the colored spots may be disregarded in a white classification. But color classification becomes more complicated in the case of the yellow, red, and brown colors, because these colors are so blended in some of the grain sor-

ghums that sharp distinctions between yellow, red, and brown, for grading purposes, might be difficult to apply. This problem is intensified, of course, when the natural colors have been modified by weathering or bleaching.

When, in inspection procedure, under the proposed Plan B, type characteristics may be used to supplement the class or subclass color specifications, the inspection difficulties above referred to would be largely obviated. In the case, for example, of yellow milo and red kafir type characteristics would be of practical value in the determination of class and subclass, even though classification by color alone might be difficult. But it is possible that some difficulty might be encountered in the classification of some varieties on a color basis only as of the class Yellow subclass Yellow, or as of the class Red subclass Red, or as of the class Brown, where the grain sorghum in question is not of the kafir, milo, or durra type, because of the difficulty of definitely distinguishing between the so-called yellow, red, and brown grain sorghums.

To a considerable extent this problem in the application of class and subclass color specifications pertains to present and future varieties that are not, or would not be, of the standard kafir or milo types. Insofar as the commercially important kafir and milo types are concerned the problem of classification is no more difficult under Plan B than under Plan A. If the difficulties in color classification heretofore mentioned are not considered insurmountable by the inspection agencies in the grain-sorghums markets, Plan B would provide more definite methods for the classification of new varieties that are not distinctly of the kafir or milo type than either Plan A or the present official standards.

Another problem in connection with Plan B that should be given consideration by the grain-sorghum industry is that of the change that Plan B would make in the grading of certain mixtures of grain sorghums. Under the present official standards, as well as under Plan A, mixtures, for example, of white kafir and red kafir, or mixtures of yellow milo and white milo, which in either case do not contain more than 10 percent of grain sorghums of other classes, are included in the subclass Kafir or the subclass Milo, as the case might be. Under Plan B, mixtures of white kafir and red kafir, or mixtures of yellow milo and white milo, would fall into Mixed Grain Sorghums. It is doubtful whether this change in the grade designation for some of the mixtures of grain sorghums is a matter of any great commercial significance, provided that the grade certificate gives information as to the types of grain sorghums in the mixture. It should be observed, therefore, that in the proposed grades for Mixed Grain Sorghums under Plan B, the specifications provide for the inclusion of subclass names in the grade designation when the mixture consists of 70 percent or more of grain sorghums of the types white kafir, white durra, yellow milo, and red kafir, singly or combined, and not more than 10 percent of brown grain sorghums.

Classification of Wheatland Milo

Under Plan A as well as in Plan B for the classification of grain sorghums, it is suggested that the new variety of grain sorghums known as Wheatland milo, and which is of milo type, should be excluded from the premium subclass Yellow Milo, and be included in the proposed subclass Milo under Plan A or in the proposed subclass Yellow under

Plan B. Although this new variety is distinctly of milo type it normally differs from yellow milo in that it has seeds of slightly smaller size and is usually of a buff or weak yellowish-red color that lacks the sheen and color strength of the natural color of yellow milo.

Color is an important factor in the market evaluation of grain sorghums, and, for this reason, some of the grain-sorghum markets discount Wheatland milo under the prices for yellow milo and contend that the inclusion of Wheatland milo in the subclass Yellow Milo would function to depress bids by grade for yellow milo in the event that the marketings of Wheatland milo should become of magnitude. From the information now available to the Bureau (June 1933) it appears that this point of view is not fully supported by all the grain-sorghum markets, and, for this reason, the Bureau desires to receive additional testimony on this subject from the grain-sorghum industry prior to making a final decision as to whether Wheatland milo should be definitely included in or excluded from the premuim subclass Yellow Milo.

Proposed Elimination of the Grade Factor "Total Other Grains"

It is recommended in the proposed standards for grain sorghums that the grade factor "total other grains" be eliminated. The grade factor "nongrain sorghums", however, would be retained with the same grade specifications as those of the present official standards.

In the present official standards "other grains" are defined as wheat, nongrain sorghums, corn, oats, barley, rye, emmer, spelt, einkorn, rice, cultivated buckwheat, and flaxseed. Thus, under this definition for "other grains" and the grade requirements of the present official standards, grade No. 2, for example, may contain a maximum quantity of 5 percent other grains of which 3 percent may be nongrain sorghums and the remaining 2 percent might be damaged oats, for example, or any other grain included in the definition for "other grains".

With the exception of nongrain sorghums, none of the other grains included in the definition for "other grains" are grown naturally with the grain sorghums. Thus, when found in the grain sorghums, they are present, in the vast majority of cases, because of premeditated mixing or careless elevator management. Under these circumstances, the grade requirements of the present official standards for "total other grains" are unnecessary and serve no useful purpose in the grading of country-run grain sorghums. They function only to create opportunities for mixing that is objectionable to the users of grain sorghums, when market prices for any of the other grains are below those for the grain sorghums. Natural mixtures of nongrain sorghums in the grain sorghums are found occasionally, however, and for that reason the grades should include maximum limitations for the nongrain sorghums.

According to the experience of the grain inspection agencies in the terminal markets only a very few car lots of grain sorghums received from farmer and country elevator shippers have been observed that contained "other grains" other than nongrain sorghums. Also supervised inspection data covering the receipts of grain sorghums in all United States markets for the 6-year period 1926–27 to 1931–32, show that the average, annual percentage of such receipts grading lower than No. 1 on the factor "total other grains" (inclusive of nongrain sorghums) was only about 2 percent. It is known, therefore, that if

the grade factor "nongrain sorghums" is retained and the factor "total other grains" eliminated, no injury of any consequence would result to grain-sorghum shippers from the lowering of the grades assigned to country shipments.

Proposed Revision of the Factor "Foreign Material and Cracked Kernels"

It is recommended in the proposed grain-sorghums standards (1) that the special limitations on "sand, dirt, and finely broken kernels" be eliminated entirely from the grade factor "foreign material and cracked kernels", and that, in lieu thereof, a dockage system for the grain sorghums should be adopted, (2) that the name of the present grade factor "foreign material and cracked kernels" should be changed to "cracked kernels and foreign material", and (3) that the grade limitations for the factor "foreign material and cracked kernels", of 3, 6, and 10 percent for grades 1, 2, and 3, respectively, of the present official standards, should be increased for the factor "cracked kernels and foreign material" of the proposed standards, 4, 8, and 12 percent, for grades 1, 2, and 3, respectively.

The principal reasons for these proposed revisions are given in succeeding paragraphs.

Dockage in Grain Sorghums

Under the present official standards for grain sorghums, and during the 6-year period 1926–27 to 1931–32, inclusive, the factor of sand, dirt, and finely broken kernels, was the cause for assigning grades below No. 1 to 8 percent of the receipts of grain sorghums, according to inspection data compiled from the supervised market receipts of grain sorghums in all markets. About 6 percent of the receipts were graded lower than No. 2 on account of this factor. In some years, and in some important markets, this grading factor is of special significance in determining the grade of the grain-sorghum crops of the semiarid areas of the Southwestern States where the grain is often piled outdoors, where sand and dirt are often blown into the grain or picked up with the grain in handling it, and where much of the grain is marketed without removing the sand and dirt. For example, during the 2-year period 1926–27 and 1927–28, at Hutchinson, Kans., an annual average of approximately 32 percent of the receipts of all classes of grain sorghums graded lower than No. 1 and approximately 22 percent graded lower than No. 2, while in one year, 1926, approximately 40 percent of the receipts of milo graded lower than No. 1, on account of the factor "sand, dirt, and finely broken kernels", according to Federal supervision data.

Sand, dirt, and finely broken kernels are removed readily from grain sorghums by screening and usually are removed at the terminal markets prior to the time the grain is graded out of the elevators and merchandised to consumers. Thus, the grade factor of "sand, dirt, and finely broken kernels" in the present official standards functions to lower the numerical grade of country-run grain sorghums to a greater extent than it does to lower the grade of ex-elevator grain sorghums. It is believed, therefore, that the adoption of a dockage system for grain sorghums would function to effect a more equitable application of the standards to country-run grain sorghums that con-

tain sand, dirt, and finely broken kernels, than the retention of the present system of using this material as a factor for the determination of numerical grade.

The tolerance for unassessed dockage in the proposed dockage system for grain sorghums would be any quantity less than 0.5 percent, instead of the tolerance of any quantity less than 1 percent specified in the present official standards for wheat and rye. This tolerance is identical with the tolerance for "sand, dirt, and finely broken kernels", in grade No. 1 of the present official standards for grain sorghums. Assessed dockage in grain sorghums would be stated in terms of half percent, or whole percent, or whole and half percent, as the case might be.

Proposed Increase of Grade Limitations for "Cracked Kernels and Foreign Material"

The factor of "cracked kernels and foreign material" in the grain-sorghums standards applies principally to cracked kernels caused by threshing and elevator handling. As a general rule the grain sorghums contain little or no foreign material, except sand and dirt which is treated separately in both the official and the proposed standards. In many years the factor of cracked kernels is a factor of outstanding importance in determining the numerical grade of the market receipts of grain sorghums. According to inspection data for the 6-year period 1926–27 to 1931–32, covering the supervised receipts of grain sorghums at all United States markets, the average annual percentage of such receipts grading lower than No. 1 on this factor (more than 3 percent cracked kernels) was 48 percent, while the percentage grading lower than No. 2 (more than 6 percent cracked kernels) was 19 percent. There were 3 years during this period, namely, 1926–27, 1927–28, and 1930–31, when the percentages grading lower than No. 2 on this factor were materially higher than the average for the 6-year period, being approximately 22, 28, and 24 percent, respectively, for the years mentioned.

Supplementing these data, the country shippers of grain sorghums in Texas have given testimony that, from their observation, it is a common occurrence for the percentage of cracked kernels in country-run kafir to be from 4 to 6 percent and in milo from 6 to 8 percent, and that, during the peak of the market movement, when time is not available for screening out the cracked kernels, many car lots of dry, pure, high-test-weight grain sorghums are graded below No. 2 which, on a feed utility basis of evaluation, are entitled to a top-grade designation. The testimony of elevator operators indicates also that with each elevator-transfer handling of dry grain sorghums the quantity of cracked kernels usually increases from 1 to 2 percent.

For all these reasons, as well as because there is no market usually at country-shipping points for cracked kernels, whereas such kernels may be sold to feed grinders usually at the terminal markets, the the Bureau believes that the liberalized limitations for "cracked kernels and foreign material" of 4, 8, and 12 percent for grades 1, 2, and 3, respectively, of the proposed grain sorghums standards, should exert a beneficial and equitable influence on the grading of the grain sorghums, and should function further to distribute the market receipts among the respective numerical grades in greater conformity

with utility values than the present grade limitations of 3, 6, and 10 percent, which appear to be unnecessarily rigid.

EASTERN BARLEY STANDARDS (BARLEY, CLASS I)[38]

Including a Subclass for Malting Barley

A material revision of the present official standards for eastern barley (Barley, Class I) is recommended by the Bureau. The principal proposed revisions and additions are: (1) the division of the class Barley into two subclasses, one for Malting Barley and the other for Barley (so-called feed barley), (2) the elimination of grades Special No. 2 and No. 1 Feed and the adoption of five grades numbered 1 to 5, inclusive, (3) the adoption of a test-weight-per-bushel specification of 47 pounds for grade No. 1 in lieu of the present specification of 48 pounds, (4) the adoption of "sound barley" specifications of 93 and 90 percent for the proposed grades No. 2 and No. 3, respectively, in lieu of the specifications of 92 and 86 percent for the present official grades, Special No. 2 and No. 2, respectively, (5) the elimination of the grade factor "oats and wild oats", (6) the adoption of the dockage system for fine seed material in barley, (7) the adoption of special grades for Bright and Stained in lieu of the grade factor "general appearance", and (8) the adoption of special grades for Tough in lieu of the grade factor "moisture content", in the present official standards.

The principal purposes of these proposed revisions and additions are: (1) to make the standards for Barley (Class I) conform more closely with the different qualities and values commonly found in country-run barley produced east of the Rocky Mountains and with the requirements of our domestic commerce in barley, than do the present official standards, and (2) to establish useful and practical commercial standards for malting barley, applicable to barley produced east of the Rocky Mountains.

Distribution of Barley Receipts by Grade Under Present Official Standards (Barley, Class I)

Experience had in the use and application of the present official standards for eastern barley (Barley, Class I) since 1926, indicates that the various grade specifications cause unbalanced proportions of the total market receipts of barley to fall into the respective grades.

According to data from the supervised market receipts of eastern barley for the 6-year period 1926–27 to 1931–32, inclusive, the average percentages of such receipts that fell into the respective grades of the present official standards were approximately as follows: Grade No. 1, 1 percent; Special No. 2, 21 percent; No. 2, 14 percent; No. 3, 28 percent; No. 4, 14 percent; No. 1 Feed, 5 percent; and Sample grade, 17 percent.

According to investigational data from about 800 samples of eastern barley receipts of the 1932 crop, obtained principally from Minneapolis, Chicago, Milwaukee, and St. Louis, the percentages that fell into the respective grades of the present official standards were approximately as follows: Grade No. 1, 1 percent; Special No. 2, 39 percent; No. 2, 4 percent; No. 3, 26 percent; No. 4, 4 percent; No. 1 Feed, none; and Sample grade, 26 percent.

[38] The phrase "eastern barley", as used in this discussion, refers to white barley (Class I) grown east of the Rocky Mountains.

The data from both these sources show that, under the present official standards for eastern barley (Barley, Class I) unduly small percentages of country-run barley fall into grades No. 1 and No. 2 (third grade) and unduly large percentages thereof fall into grades Special No. 2, No. 3 (fourth grade), and Sample grade.

For these reasons the present official standards for eastern barley do not adequately portray relative quality in the receipts of market barley and do not provide practical volumes of barley in grades No. 1 and No. 2 (third grade) for trading purposes in the important primary markets. Also the widely inclusive character of grades Special No. 2, No. 3 (fourth grade), and Sample grade, causes each of these grades to cover a wide range in quality; thus, the market quotations by grade for barley graded as Special No. 2, No. 3, and Sample grade, may be, and often are, inequitable for the superior types of barley included in these grades.

A study of the Daily Market Record (Minneapolis) for the 3-year period 1929–30 to 1931–32 shows consistent daily quotations for barley of the grades Special No. 2 and No. 3 (fourth grade) but only scattering quotations for barley of the grades No. 1 and No. 2 (third grade). Furthermore, the trading in barley of the grades No. 1 and No. 2 (third grade) was so restricted in voume, apparently, that quotations for No. 1 Barley, when made, tended to follow quotations for Special No. 2, while quotations for No. 2, when made, tended to follow quotations for No. 3.

Among all the various factors and specifications causing this unbalanced distribution of country-run barley among the respective grades of the present official standards for eastern barley, the following may be listed as of principal importance: (1) The comparatively high test-weight-per-bushel requirement of 48 pounds for grade No. 1, (2) the identical test-weight requirements (46 pounds) for grades Special No. 2 and No. 2 (third grade), which cause many lots of barley to be de-graded two grades from Special No. 2 (second grade) to No. 3 (fourth grade) when the test weights are slightly less than 46 pounds but when the barley otherwise meets the requirements of either grade No. 1 or Special No. 2, (3) the "general appearance" specifications for grades No. 1 and Special No. 2, which have but little, if any, relation to utility value, but which may lower the volume of No. 1 Barley and increase the volume of Special No. 2 Barley, because of the slight distinction between "slightly stained" and "stained," and (4) the factor "foreign material" which functions to determine the numerical grade of a material volume of eastern barley as No. 2 (third grade) or No. 3 (fourth grade), which barley is often of otherwise top-grade quality and which would not be de-graded under a dockage system for fine-seed material. Also the methods employed during the period 1926–27 to 1931–32 for the grading of all so-called "scabby barley" into Sample grade were the principal cause for the unduly large proportion of eastern barley that fell into Sample grade.[39]

Comparison of Domestic and Export Requirements for Barley Standards (Barley, Class I)

Further experience had with the standards for eastern barley, since their promulgation in 1926, indicates that, in consideration of the present and probable future international commerce in grain, the

[39] Special grades for "Blighted" barley, applicable to all barley containing more than 2 percent but not more than 5 percent of blight and/or mold damaged kernels, were promulgated in 1933, effective July 21, 1933.

present official standards give undue consideration to the point of view of the barley exporters and insufficient consideration to the requirements of the domestic barley trade and the domestic users of barley. Grade No. 2 (third grade) of the present official standards, for example, that was formulated originally for export purposes, has but little usefulness in the domestic barley commerce. It does not designate a natural degree of quality in a series of numerical grades in conformity with users' requirements or in conformity with farm-production conditions. It represents, in fact, an artificial combination of qualities and materials in barley. No extensive volume of natural barley conforms with its grade requirements and when natural barley of other grades is artificially mixed to meet all the grade requirements of No. 2 Barley (Class I) the resulting product is one that does not meet the requirements of many domestic users of barley.

Whatever usefulness this grade (No. 2 Barley, Class I, of the present official standards) may have had in the period 1926 to 1929, its usefulness in the future is problematical. The exports of United States barley have decreased materially since the period 1926 to 1929. During the crop year 1927–28 the total United States exports of barley other than the exports through San Francisco, amounted to approximately 28,000,000 bushels; during 1928–29, to approximately 48,000,000 bushels; during 1929–30, to approximately 6,000,000 bushels; during 1930–31, to approximately 300,000 bushels; during 1931–32, to approximately 800,000 bushels and during 10 months of the year 1932–33 to approximately 650,000 bushels. Furthermore, the increased production of barley in recent years in the Danube Basin countries has operated to meet practically all the import feed barley requirements of Germany and the United Kingdom at prices, based on comparatively low costs for transportation to these markets, with which the United States has not been able to compete successfully.

For these reasons, the requirements of the domestic trade in barley should properly be given more consideration in the formulation of revised standards for eastern barley (Barley, Class I) than the point of view of the export trade. It is believed by the Bureau that the interests of domestic barley producers, feeders, feed dealers, mixed-feed manufacturers, maltsters, and other processors, would be met better by eliminating from the present official barley standards the grade terms "Special No. 2" and "No. 1 Feed", and by substituting for the present six numerical grades a series of five numerical grades, each of which would be based on grade requirements that would conform with the natural gradations in the quality of country-run barley, and that would designate relative degrees of quality particularly for domestic barley users. By these means the principle of including two No. 2 grades in the standards for eastern barley, one of which, Special No. 2, was intended for use in domestic commerce, and the other of which, No. 2, was intended for use in export commerce would be abandoned.

Such grades would not necessarily preclude the possibility of exporting eastern barley by grade to European markets in the future, should future demands for United States barley arise in these markets. Should such demands be for a relatively high-grade type of barley they could be fulfilled with deliveries of barley of the proposed grades No. 1 or No. 2, or if the demands should be for a relatively low-cost low-grade, type of barley, they could be fulfilled with deliveries of

barley of the proposed grades No. 3 or No. 4. Past experience with European buyers indicates that, irrespective of the grade terms employed in standards, they quickly familiarize themselves with the minimum quality associated with any given grade and bid accordingly. In this connection it is pertinent to observe that Canadian exports of barley to Europe, made since 1926 in competition with United States barley, have been made principally under the Canadian grade designations of No. 3, C.W., No. 4, C.W., and Canadian Feed.

The needs of the barley industry of the United States for standards for malting barley constitute one of the major reasons for the proposed material revision of the standards for eastern barley. The domestic demand for market barley for malting purposes is a factor of outstanding importance in determining the market price of barley grown east of the Rocky Mountains. Thus, in the formulation of standards for eastern barley, the requirements of the domestic malting industry should be given much consideration. A material revision of the present official standards for eastern barley is considered essential by the Bureau to meet the requirements of this industry.

In the succeeding parts of this section the principal proposed revisions of and additions to the present official standards for eastern barley (Class I) for the purpose of meeting the requirements of the domestic malting industry, as well as for the general purpose of providing a more practical trading volume of barley in each of the grades, are discussed in detail.

MALTING BARLEY SPECIFICATIONS

Proposed Subclass for Malting Barley (Barley, Class I)

The Bureau's recommendation to divide the class Barley (Class I) into two subclasses, (*a*) Malting Barley, and (*b*) Barley, is, in its essence, a proposal to segregate from the total production of eastern barley a commercial quantity of barley that would meet the minimum requirements of the malting industry for barley of malting type. This segment of the eastern barley crop would then be graded No. 1, No. 2, or No. 3, Malting Barley, as the case might be, according to numerical grade requirements applicable to both subclasses.

This malting-type segment of eastern barley (subclass *a*) would differ principally from the common run of so-called "feed barley" (subclass *b*) in that it would be restricted to barley which is comparatively uniform as to the variety or type preferred for malting purposes, comparatively uniform as to size of kernels, comparatively mellow in character, comparatively free from damage and from skinned kernels, and which meets the requirements of the unqualified numerical grades No. 1, or No. 2, or No. 3, that are applicable to both subclasses.

By these methods each of the proposed grade designations No. 1 Malting Barley, No. 2 Malting Barley, and No. 3 Malting Barley, would guarantee buyers the same minimum malting-type quality according to such important factors as variety or type uniformity, kernel-size uniformity, mellowness, and freedom from damage of various kinds, while gradations in quality according to such general purpose grade factors as "test weight per bushel", "sound barley", "heat-damaged kernels", and "foreign material", would be indicated by the grade numbers 1, 2, and 3.

Although these proposed methods and specifications for the grading of malting-type barley would provide three numerical grades of malting barley, they would not differentiate malting quality in barley to correspond fully with the maltster's differentiations known as "fancy", "choice", and "standard", based on different degrees of "sizing" and mellowness and other factors of quality. The proposed subclass, Malting Barley, however, would provide a relatively simple plan for differentiating all barley having malting quality approximately comparable with the maltster's so-called "standard" quality from other barley which has little or no utility value for malting purposes, and for differentiating this segment of the barley crop into three numerical grades according to such grade factors as "test weight per bushel", "sound barley", and "foreign material".

The proposed grade No. 2 Malting Barley, for example, would represent a general level of malting quality in barley that is more or less comparable with the so-called "standard" type of barley in the malting industry, and it is barley of this quality level that comprises the greater part of the barley utilized for malting purposes. Some of the fancier types of malting barley would be represented in the proposed standards by such grade designations as No. 1 Bright Malting Barley and No. 2 Bright Malting Barley.

The proposed subclass Malting Barley, and the three numerical grades applicable to it, would be practical and simple for commerical inspection purposes, would include a large volume of barley for futures trading purposes, and should serve the needs of the barley industry for definite "contract grades" in connection with futures trading, sales to arrive, and market quotations for Malting Barley. Above the level of minimum quality represented by the proposed grades No. 1 Malting Barley and No. 1 Bright Malting Barley, there would be many commercial lots of relatively superior malting-type barley that maltsters would purchase by sample in the terminal markets, pay premiums for, and utilize in those malting operations that require malting barley of very fancy type. The merchandising principles involved in this matter would be comparable with those now in effect for wheat of very fancy quality.

The proposed "sizing" specifications in the subclass Malting Barley would be applied by an automatic, continuous flow, motor-driven sieving device that would handle samples as large as 800 grams or more, and that would provide for a greater degree of inter-market uniformity in the application of these specifications than hand sieves. The proposed specifications for "mellowness" would be based on the starchy (not steely) character of the kernels of a sample of barley.

The percentage specifications for sizing and mellowness given in the proposed subclass Malting Barley are based on the best information available at the time of writing this report (June 1933). Further research by the Bureau on these subjects with representative samples from the 1933 barley crop may develop information that will necessitate a revision of these tentative specifications for sizing and mellowness. Cooperation with the malting industry is needed and desired in the final determination of these specifications and of the methods for applying them.

SEPARATE CLASS AND SEPARATE NUMERICAL GRADE REQUIREMENTS FOR MALTING BARLEY IMPRACTICABLE

Various suggestions have been made to the Bureau with respect to standards for malting barley based on the theory of perpetuating the present official standards for eastern barley (Barley, class I) for use in the marketing of feed barley, and of formulating a new and separate class for barley of malting type, produced east of the Rocky Mountains, which class would be accompanied by a new and separate series of numerical grades and grade requirements applicable only to barley classifying as malting barley. Such standards would classify malting barley principally according to the varieties or types preferred for malting purposes, and would include three numerical grades that would designate three degrees of malting quality corresponding approximately to the maltster's ideas of so-called "fancy", choice", and "standard" quality. The factors usually suggested for the determination of numerical grade would include the same grade factors now used in the present official standards for eastern barley (Barley, Class I), but with several stricter requirements for each of the numerical grades, together with several new and additional grade factors such as "size of kernels", "mellowness", "germination tests", and "damaged kernels".

Although such standards for malting barley would be more ideal for the purpose of measuring the relative degrees of malting quality in barley than the subclass plan for malting barley recommended by the Bureau, there are two important objections to this plan of adopting a separate class with separate numerical grade requirements for malting barley, namely; (1) the confusion such standards would cause in the grading and merchandising of feed barley, and (2) the impracticability of applying them in a sufficiently prompt and accurate manner to fulfill market requirements for inspection and certification.

Should standards for malting barley, based on a separate class and separate numerical grade requirements, be promulgated under the mandatory provisions of the Grain Standards Act, along with another separate class and separate numerical grade requirements for eastern barley not of malting type (so-called feed barley), the required inspection procedure would be for inspectors to first determine whether any given sample met the requirements for the class Malting Barley. If so, the sample would be graded No. 1, No. 2, or No. 3, Malting Barley, as the case might be. But if the sample failed to meet the requirements for the class Malting Barley it would then be graded as one of the other of the grades of the class Barley (so-called feed barley).

Under such standards and inspection procedure there could and would be many cases where a given lot of barley would grade as No. 2 or No. 3 Malting Barley, according to the relatively strict grade requirements for the evaluation of barley for malting purposes, but would grade as No. 1 or No. 2 Barley (1 to 2 grades higher) according to the grade requirements for the evaluation of barley for feed purposes. Thus, in those grain markets where the merchandising of malting barley is of little or no significance, the required certification of some lots of barley as No. 3 Malting Barley, for example, which barley, if it could be graded under the standards for ordinary barley

(so-called feed barley) would grade and be certificated as No. 1 Barley or No. 2 Barley, would be a distinct and serious hindrance to the merchandising of barley in either the domestic or export commerce in feed barley. Under such circumstances, the grain merchant, for example, who is under contract to deliver No. 2 Barley by grade would not be satisfied with certificates for No. 3 Malting Barley for use in evidencing the fulfillment of his contract, when he has barley available for delivery that meets all the requirements for No. 2 Barley (so-called feed barley) but which barley would have to be graded as No. 3 Malting Barley.

A second important objection to all plans that have been suggested for the adoption of a separate class and separate grade requirements for malting barley, is that standards of this character would be impracticable for prompt and accurate application by the numerous public grain-inspection agencies. The adoption of separate germination test specifications, for example, would slow down inspection procedure to such an extent as to make inspection impracticable for commercial purposes, while the adoption of separate kernel-sizing specifications, and separate mellowness specifications, for each of three numerical grades, would be a fertile source of nonuniform grading between markets and inspectors.

Advantages of Proposed Subclass Malting Barley (Barley, Class I)

In consideration of the commercial and inspection problems above stated, the Bureau believes that the grade requirements of the malting-barley and feed-barley industries could be fulfilled best by the adoption of a subclass for malting barley, and another subclass for barley that would include all eastern barley not coming within the specifications for malting barley, together with the adoption of but one series of numerical grades applicable to both subclasses. So far as inspection procedure and inspection administration are concerned, this barley-standardization plan would assure more prompt and accurate commercial inspection service than the plan to adopt separate classes and separate grade specifications for malting barley and feed barley.

The subclass plan, also, would cause but little, if any, interference with established practices in the merchandising of barley for feed purposes. With but one series of numerical grades in effect, the numerical grade assigned to barley of malting type (proposed subclass *a* Malting Barley) could never be either lower or higher in numerical rank than the numerical grade that would be assigned if the barley were graded under the proposed subclass *b* Barley (so-called feed barley). In other words, any given lot of barley that would meet the requirements of the proposed grade No. 2, for example, would grade either as No. 2 Malting Barley or No. 2 Barley, according to whether the barley would meet the requirements of the proposed subclass for Malting Barley, or would not do so.

Although, under such proposed methods of grading and certification, barley graded as No. 2 Barley would not be deliverable on a contract for No. 2 Malting Barley, the established practices and market rules of the grain trade would usually allow deliveries of No. 2 Malting Barley, for example, on contracts for No. 2 Barley, because, in the latter case, the delivery would be equal to the quality of No. 2 Barley, or better. Similar practices commonly prevail in the mer-

chandising of corn, oats, and wheat, and there is no logical reason why they should not prevail in the merchandising of barley.

Finally, the proposed subclass plan for the standardization of malting barley would provide contract grades of malting barley, sufficiently broad in their specifications to include a practical commercial volume of each crop of barley for the purposes of a barley futures market, yet sufficiently restrictive in their specifications to guarantee contract deliveries of barley of reasonably fair, average, malting quality, that would be acceptable to and usable by the maltsters.

Proposed Test Weight Specification of 47 Pounds for Grade No. 1 (Barley, Class I)

Under the present official standards for eastern barley (Barley, Class I) only about 1 percent of the market receipts of barley are graded No. 1, according to inspection supervision data and investigational data. One of the important reasons for this small market volume of No. 1 Barley is the existing test weight specification of 48 pounds for grade No. 1.

According to investigational data from 1,200 samples of eastern barley of the 1931–32 and 1932–33 crops, obtained principally from Minneapolis, Chicago, Milwaukee, and St. Louis, only 10 percent of the samples had a test weight per bushel of 48 pounds or more, and met the test weight requirement, therefore, of grade No. 1 of the present official standards; while 29 percent of the samples had a test weight of 47 pounds or more. Thus, according to these data, if the test-weight specification for grade No. 1 were lowered from 48 pounds to 47 pounds, it would allow an additional 19 percent of the market receipts of barley to meet the requirements of grade No. 1, so far as this important grade-determining factor is concerned.

The difference in test weight per bushel between 48 pounds and 47 pounds is of small commercial significance as well as of small significance in measuring the utility value of barley for either malting or feed purposes. Thus, barley that is otherwise of No. 1 grade quality and that weighs 47 pounds per bushel merits inclusion in grade No. 1. For this reason, as well as for the desirable purpose of causing a better distribution of the market receipts among the important commercial grades No. 1, No. 2, and No. 3, than that which now prevails, the Bureau recommends in the proposed standards for eastern barley that the test weight requirement for grade No. 1 be specified at 47 pounds per bushel.

Proposed Grade Requirements for "Sound Barley" (Barley, Class I)

It is recommended in the proposed standards for eastern barley (Barley, Class I) that the grade requirements for "sound barley" in the second, third, and fourth grades should be revised from 92, 86, and 86 percent, respectively, to 93, 90, and 80 percent, respectively. The requirement for grade No. 1 would remain at 95 percent. Logically, the requirement for grade No. 1 should be 96 percent, and, while many members of the barley trade have already recommended the 96 percent requirement, the Bureau believes it desirable to retain the present specification of 95 percent in order that barley containing a maximum quantity of 5 percent blight-damaged kernels,

but which otherwise meets the requirements of grade No. 1, would grade No. 1 Barley, Blighted instead of No. 2 Barley, Blighted, as would be the case under the proposed standards if the "sound barley" requirement for grade No. 1 were specified at 96 percent.

The principal purposes of these proposed revisions are (1) to cause "sound barley" requirements of the first four numerical grades to conform more closely with the percentages of sound barley that are natural in the market receipts of country-run barley than do the "sound barley" requirements of the first four numerical grades of the present official standards (2) to curb uneconomic and objectionable mixing of other grains in barley of the third numerical grade, which grade is entitled No. 2 under the present official standards, (3) to so improve the second and third numerical grades, which comprise the chief commercial grades, as to make them represent better quality, respectively, than the second and third numerical grades of the present official standards, and therefore, to increase the usefulness of these grades as contract grades, especially for barley of malting type, and (4) to prevent occasional car lots of country-run barley containing less than 86 percent but more than 80 percent of sound barley from being de-graded two grades, as is the case under the present official standards when the grade of such barley is lowered from No. 2 to No. 4 (third grade to fifth grade in rank) because of the fact that the "sound barley" specification for both of the grades No. 2 and No. 3 of the present official standards is 86 percent.

High Percentage of Natural Barley (Class I) Contains 90 Percent or More Sound Barley

Supervision and investigational data pertaining to the factor "sound barley" in eastern barley (Barley, Class I) indicate that the sound barley requirements for the second and third grades (Special No. 2 and No. 2) of the present official standards are lower than necessary to conform with the natural percentages of sound barley in country-run barley, and, therefore, that the sound-barley requirements for the second and third grades may be made stricter for the principal purpose of improving the important contract grades without causing any material or inequitable de-grading of the market receipts of country-run barley.

According to data from the supervised receipts of eastern barley in all United States grain markets for the 6-year period 1926–27 to 1931–32, inclusive, an average of 3.2 percent of such receipts graded Special No. 2 Barley (92 to 94.9 percent sound barley) and an average of 4.6 percent of such receipts graded No. 2 Barley (86 to 91.9 percent sound barley) on account of the factor "sound barley". During this 6-year period the range by years in the percentages of the receipts grading Special No. 2 Barley, according to this factor, was from a low of 1 percent to a high of 7.7 percent, while in the case of the No. 2 grade the range by years was from a low of 0.3 percent to a high of 12.2 percent.

According to investigational data from 1,200 samples of the market receipts of eastern barley of the crops of 1931–32 and 1932–33, obtained principally from Minneapolis, Chicago, Milwaukee, and

St. Louis, 75 percent of the samples met the requirements for 95 percent or more sound barley (proposed specification grade No. 1), 87 percent of the samples met the requirements for 93 percent or more sound barley (proposed specification grade No. 2), and 95 percent of the samples met the requirements for 90 percent or more sound barley (proposed specification grade No. 3).

The investigational data from these 1,200 barley samples show further that the proposed raising of the requirements for sound barley in the second ranking numerical grade from 92 percent to 93 percent and in the third ranking numerical grade from 86 percent to 90 percent would function to decrease the volume of market receipts in the second numerical grade by only 4 percent and in the third numerical grade by only 2.5 percent, according to this grade requirement.

A special study of the factor "sound barley" in the cargo shipments of barley from Duluth was made, also, because the Duluth cargo shipments have been the source of the major part of the feed-barley export shipments of former years. This study showed that 41 cargo shipments of barley were made during the 1931 lake-shipping season in which the average percentage of sound barley was 93.76. Under the present official standards, 28 of these cargo shipments graded Special No. 2 and had an average sound-barley content of 94.28 percent, 12 shipments graded No. 2 and had an average sound-barley content of 92.9 percent, and 1 shipment graded No. 3 which had a sound-barley content of 89.4 percent. During the 1932 lake shipping season, 35 cargo shipments of barley were made in which the average percentage of sound barley was 93.48. Under the present official standards, 16 of these cargo shipments graded Special No. 2 and had an average sound-barley content of 96 percent, 18 shipments graded No. 2 and had an average sound-barley content of 91.23 percent, and 1 shipment graded No. 3 which had a sound-barley content of 93.8 percent.

Contract Grades (Barley, Class I) Would Be Improved by Proposed "Sound Barley" Revisions

The improvement of two of the contract grades (second and third grades), and the quality of the deliveries thereunder that would be effected by a tightening of the requirements for sound barley, especially in the third grade, should increase the usefulness of these grades for barley users, and should be of benefit to producers and shippers in that the comparatively better quality of the deliveries under these grades should tend to strengthen the contract prices for barley that would meet the requirements of these grades. The data previously given with respect to the percentages of sound barley in the market receipts of barley and in the commercial cargo shipments of barley from Duluth, indicate that a high percentage of the market barley would meet the proposed grade requirements for sound barley without suffering loss in grade. For this reason, the proposed comparatively strict requirements for sound barley would function principally to guarantee buyers against the threat of objectionable mixing of wild oats, oats, foreign material, and other grains in contract barley.

Liberal Grade Limitations for "Sound Barley" (Class I) Reflected in Prices Bid for Export Barley

Because grade No. 2 of the present official standards (third grade in rank) has been used widely in the barley export trade of former years, and because the proposed grades for eastern barley would change the requirement for "sound barley" in this numerical grade from 86 percent to 90 percent, it is pertinent to discuss this feature of the proposed revision.

It has been shown by the data previously given with respect to sound barley that a high percentage of the receipts of country-run barley contain 90 percent or more of sound barley, and that the cargo shipments of No. 2 Barley (present official grade No. 2) from Duluth usually contain more than 90 percent of sound barley. So far as natural barley is concerned, therefore, there is usually available for both domestic and export commerce a large supply of market barley that contains 90 percent or more sound barley. Thus, the use of an 86-percent requirement for sound barley in the third numerical grade permits the mixing of wild oats, foreign material, oats, and other grains in barley to an extent which materially lowers the quality of the deliveries that may be made under this grade, which materially affects the usefulness of this grade as a "contract grade" in domestic commerce, and which is a factor of importance in widening the discounts on all barley falling within the third numerical grade.

For these reasons an 86 percent sound-barley specification for the third numerical grade is unnecessary and serves no useful purpose in domestic commerce, while in the exporting of barley it is illogical to assume that this very liberal grade requirement for sound barley functions to reflect any price benefits to the United States barley industry as a whole. Much of the feed barley heretofore exported under the official grade No. 2 (86 percent sound barley) has been mixed with other grains, wild oats, foreign material, and unsound barley, to the minimum grade requirements, and the European buyers have bid less for such barley than for competitive Canadian barley of the Canadian grades No. 3 C.W. and No. 4 C.W., the quality of which has been superior to that of United States No. 2 Barley, especially as to the percentage of sound barley.

A study covering more than 4,000,000 bushels of Canadian export barley moving through the United States Atlantic ports during the 2-year period July 1, 1929, to July 31, 1931, under Canadian certificates for No. 3 Canadian Western, and No. 4 Canadian Western barley shows that such barley of the grade No. 3 C.W. contained an average of 93.5 percent sound barley, and that such barley of the grade No. 4 C.W. contained an average of 93.2 percent sound barley, according to the methods for the interpretation of sound barley used in the United States barley standards.

A study made of prices per bushel for Canadian barley of the grade No. 3 C. W. and United States barley of the present official grade No. 2, at the important British markets Bristol, Hull, Liverpool, and London, during 9 months of the autumn-winter season of 1927–28, when there were many quotations for both Canadian and United States barley on comparable days, shows that the average price paid for the deliveries of Canadian barley was about 4½ cents per bushel higher than the average price paid for the deliveries of United States barley. This study shows, further, that during the years 1929 and

1930 the exports of Canadian barley to the United Kingdom consisted principally of barley of the grade Canadian Feed Barley, which barley, according to data obtained from cargo shipments of Canadian barley through the United States Atlantic ports, contained an average of about 82 percent sound barley. During 15 months of the years 1929 and 1930, when both Canadian export barley of the low grade Canadian Feed and United States export barley of the present official grade No. 2 Barley were being purchased by the United Kingdom, the average price for the United States No. 2 Barley exceeded the average price for the relatively low-grade Canadian Feed Barley by only about three fourths of a cent per bushel.[40]

Other features of the proposed revisions of the standards for eastern barley (Barley, Class I), which pertain to the future export commerce in feed barley, are discussed in the section entitled "Comparison of Domestic and Export Requirements for Barley Standards" on page 93.

Proposed Elimination of Grade Factor "Oats and Wild Oats" (Barley, Class I)

In consideration of the proposed increased minimum limitations for sound barley in the second and third numerical grades of the standards for eastern barley, it appears unnecessary to continue the use of the grade factor "oats and wild oats" of the present official standards.

The elimination of this grade factor would effect no change in the maximum quantity of oats and wild oats permitted in the third numerical grade, but would allow 2 percent more oats and wild oats in each of the first and second numerical grades in those cases where neither foreign material nor unsound barley is present to function against the grade requirements for sound barley. In practice, however, barley usually contains some foreign material and unsound kernels so that the liberalization for oats and wild oats in the first and second numerical grades usually would not be fully as great as 2 percent.

There are two advantages that would accrue from the adoption of this proposal. (1) It would simplify inspection procedure by the elimination of the special determination for "oats and wild oats" that now has to be made in addition to the more or less similar determination for sound barley. (2) It would prevent the technical de-grading from the first numerical grade to the second grade, or from the second numerical grade to the third grade, of numerious country-run lots of barley, especially barley produced in the Corn Belt area, which would grade into the first or second grade but for the presence of small quantities of oats in excess of the present special limitations on oats and wild oats.

This latter phase of barley grading has significance in connection with the proposed subclass Malting Barley, wherein barley of malting type is restricted to barley that meets the requirements of the first three numerical grades only, and wherein the proposed grade No. 2 Malting Barley would probably become the basic contract grade. The buyers of barley for malting purposes do not object seriously to

[40] Prices per bushel at British markets are based on shillings per hundredweight converted to United States cents per bushel of 48 pounds at current rates of exchange during the periods stated.

small quantities of oats and wild oats in barley otherwise of good quality for malting purposes. The slight liberalization for oats and wild oats proposed in the first and second grades would, therefore, have no important effect on the acceptability of the barley within these grades for malting purposes, and would function, on the other hand, to allow some lots of excellent malting type barley to stay within the requirements of the first or second grades for malting barley that would otherwise take a discount that would be disproportionate with their utility value.

Proposed Revision of the Specifications for "Skinned and Broken Barley" (Class I)

It is recommended in the proposed standards for eastern barley that "skinned barley" be eliminated as a factor for the determination of numerical grade. This factor, however, is of such great importance in malting barley that a maximum limitation of 3 percent skinned kernels is recommended in the proposed subclass for malting barley.

Under these proposed specifications, no barley containing more than 3 percent skinned and/or hull-less barley could be graded and designated as Malting Barley (proposed subclass *a*). Barley containing more than 3 percent skinned kernels and/or hull-less barley would have to be graded and designated as Barley (proposed subclass *b*). In neither one of the subclasses, however, would the numerical grade be determined according to various percentages of skinned kernels.

In so far as feed barley (proposed subclass *b* Barley) is concerned there is no justification for a grade requirement for skinned kernels, because the percentage of skinned kernels is not correlated in any way with the value of the barley for feed purposes. A lot of barley containing 10 or 20 percent of skinned kernels may, in fact, be more valuable for feed purposes than another lot containing but 3 percent of skinned kernels, because the first lot would contain less low-nutritive fibrous material than the second lot.

Dockage System Proposed for Eastern Barley (Barley, Class I)

In the present official standards for barley, a dockage system is in effect for the class Western Barley (barley grown west of the Great Plains area) but not for the class Barley (barley grown east of the Rocky Mountains). It is recommended in the proposed standards for eastern barley (Barley, Class I) that the dockage system be adopted for this class as well as continued for Western Barley (Class III). Dockage in all classes of barley would be determined by means of the so-called buckwheat sieve (8/64-inch triangular perforations), supplemented by the Cox indented sieve when bur-clover seed pods are present. Dockage, therefore, in all barley throughout the United States, would consist principally of small weed seeds, and in barley of California origin would also consist partly of bur-clover seed pods. There are two principal reasons for this recommended revision.

Eastern Barley Contains More Foreign Material Than Western Barley

In the first place, studies of foreign material in barley grown east of the Rocky Mountains and in barley grown west of the Great Plains area, have shown that the eastern barley contains from 2 to 3

times more foreign material, on the average, than the Western barley, and that the greater part of such foreign material consists of small-sized, easily separable weed seeds. A considerable part of these weed seeds usually consists of black weed seeds such as mustard and cockle, which have little feed value and which, in some cases, are detrimental as feed. In the important barley States of Minnesota, North Dakota, South Dakota, and Wisconsin, barley is often sown on foul land as a "cleaning crop", and so is marketed often with a relatively high content of small weed-seed material which, under the present official standards, functions to lower the numerical grade below that grade to which the barley would be entitled otherwise on such important grade factors as test weight per bushel and sound kernels.

Effect of Factor "Foreign Material" on Grading Eastern Barley

A study of inspection data covering supervised market receipts of barley of the class Barley (Eastern barley) of the present official standards for all markets for the 6-year period 1926–27 to 1931–32, inclusive, shows that approximately 8 percent of the receipts graded lower than Special No. 2 (second grade) and approximately 5 percent graded lower than No. 2 (third grade), on account of foreign material. In 1927–28, approximately 24 percent of the receipts graded lower than Special No. 2 on this factor, and approximately 13 percent lower than No. 2.

At Minneapolis and Duluth for the 6-year period 1926–27 to 1931–32, inclusive, the combined annual average percentage of barley receipts that graded lower than Special No. 2 on account of foreign material was more than double that for all other markets, being approximately 19 percent at Minneapolis and Duluth and approximately 7 percent at all other markets. During this same 6-year period at Minneapolis and Duluth approximately 13 percent of the barley receipts graded lower than No. 2 (third grade) on this factor. For the 2-year period 1927–28 and 1928–29, at these important barley markets, the annual, average percentages were even higher, being approximately 25 percent for barley graded lower than Special No. 2 and approximately 15 percent for barley graded lower than No. 2, on account of foreign material.

Uniform Method for Handling Foreign Material Desirable in All Barley Classes

In the second place, it is desirable that barley moving in interstate commerce under standards of a national character should be graded under a uniform system as regards separable foreign material (dockage). Under the existing system it is confusing to the grain trade, including foreign buyers of barley, to have the official inspection of one class of barley based on the dockage system and for another class of barley to have separable foreign material function as a factor for the determination of numerical grade, especially when the different classes of barley move in the same channels of trade. Fortunately, under the present official standards, the barley grown east and west of the Rocky Mountains has not often met in the same trade channels although it does so at times. Neither domestic nor export grain movements, however, are of a fixed character, and barley of the different classes recommended in the proposed standards may move

in the same trade channels at times according to supply and demand. Thus, it is logical as well as administratively and commercially desirable, that all barley classes should be either on a dockage basis as recommended in the proposed standards or on the basis of including all foreign material in a factor for the determination of numerical grade.

Advantages of the Dockage System for Barley

For the foregoing reasons, and in consideration of the fact that a material part of the natural foreign material of barley consists of readily separable weed seeds, the Bureau believes it would be of benefit to the entire barley industry, especially to producers and barley processors, to adopt the dockage system for all classes of barley. The market lots of barley would then have their numerical grade determined largely from such relatively important measures of quality as test weight per bushel and percentage of sound kernels, and, in no case, from the percentage of separable foreign material which is of no importance in measuring the utility value of the barley itself. The utility value of a lot of barley, for example, which contains 4 percent of separable weed seeds, but which meets the requirements of the second numerical grade according to the important factors of quality, would be expressed much more clearly for commercial purposes by the proposed grade designation No. 2 Barley, dockage 4 percent than by the present official grade designation No. 3 Barley (fourth grade) that is now applied to such barley. A dockage system in the standards for barley produced east of the Rocky Mountains also would function to curb objectionable mixing.

Wherever barley which contains separable foreign material (dockage) is sold by grade, the proposed dockage system should usually favor the interests of producers and country shippers rather than be against their interests. Under the present official standards, for example, barley containing 3 percent of separable foreign material but otherwise meeting the requirements of grade Special No. 2 is graded No. 2 (third numerical grade), while barley of similar character but containing 4 percent separable foreign material is graded No. 3 (fourth numerical grade). According to barley price quotations by grade at Minneapolis, as published in the Daily Market Record, for the 3-year period 1929–30 to 1931-32, inclusive, the discounts under Special No. 2 Barley for No. 2 Barley were commonly from 2 to 3 cents per bushel. Thus, barley of No. 2 grade, on account of separable foreign material but otherwise of Special No. 2 grade quality, was subject to discounts of 2 to 3 cents per bushel when sold by grade.

Under the proposed dockage system, the percentage of assessed dockage (separable foreign material) would be deducted from the total weight of the lot of barley in effecting the settlement between buyer and seller. Thus, in case of a car lot of barley sold by grade which contains 3 percent of assessed dockage and which would grade under the proposed standards as No. 2 Barley, Dockage 3 percent, the settlement would be made on the basis of the net weight of No. 2 Barley after the deduction of 3-percent dockage from the gross weight. For each 48-pound bushel of barley, therefore, there would be a loss of 1.4 pounds in material that would not be paid for at the current price for No. 2 Barley.

For No. 2 Barley containing 3 percent dockage, and worth about 50 cents per bushel (about 1 cent per pound), the price loss for the 1.4 pounds of dockage in each bushel would be about 1.4 cents per bushel, as compared with the discounts of 2 to 3 cents per bushel that would apply to such barley were the separable foreign material to function in lowering the grade of such barley one grade. For those lots of barley which contain 4 or 5 percent of separable foreign material, but which are otherwise of No. 2 grade quality (proposed No. 2 grade), the dockage system should usually favor the shipper to an even greater extent than in case of barley containing but 3 percent of separable foreign material, because barley containing 4 or 5 percent of separable foreign material would grade as low as No. 4 or No. 5 if separable foreign material were made a grade-determining factor in the proposed standards for eastern barley, and because of the comparatively heavy discounts usually assessed on barley graded as low as No. 4 or No. 5.

While the comparison and computations above made are based on discounts that have prevailed at Minneapolis in recent years and on the approximate current price for barley at Minneapolis (June 1933), and while it is impossible to forecast the future course of either discounts or prices, the precedents taken from the marketing practices of the past indicate that even should the price of barley rise to $1 per bushel the producer and country shipper would receive at least as much, and probably more, for their barley under the proposed dockage system as under the alternate method of employing separable foreign material as a factor for the determination of numerical grade.

The proposed dockage system for eastern barley is a matter of greater significance for producers and country shippers in connection with the grading of malting barley than in connection with the grading of so-called "feed barley." In recent years the premiums paid at the important middle-western barley markets for barley of malting type and otherwise equal to the quality of the present official grade Special No. 2, have ranged from 3 to 20 cents per bushel. In many cases these premiums would be lost to the producers and country shippers of barley of malting type should separable foreign material be employed as a factor for the determination of numerical grade in the proposed standards for eastern barley which include a subclass for malting barley.

The reasons why a policy of numerical-grade determination based on separable foreign material would be prejudicial to the interests of the producers and country shippers of malting-type barley, and why the dockage system would be more equitable, may be summarized as follows: Should separable foreign material be included with other foreign material in the numerical grade requirements for foreign material, the grade specifications probably would be: Grade No. 1 2 percent; No. 2, 3 percent; No. 3, 4 percent; No. 4, 5 percent; and No. 5, 6 percent. In the majority of cases the foreign material in barley consists of separable foreign material. Thus, all lots of country-run barley containing 3.1 to 4 percent of separable foreign material but otherwise meeting the requirements of either No. 1 or No. 2 Malting Barley, would be graded as No. 3 Malting Barley and would be discounted under the current prices for barley of the superior grades No. 1 or No. 2, as the case might be.

Furthermore, should separable foreign material function to determine numerical grade, all lots of barley containing more than 4 percent of separable foreign material but otherwise meeting the requirements of the proposed subclass Malting Barley, would grade No. 4 or No. 5, and would, therefore, be excluded entirely from the proposed subclass Malting Barley, because the proposed subclass Malting Barley is restricted to Barley of the grades No. 1, No. 2, and No. 3 and because grade No. 3 would permit not more than 4 percent of foreign material. For all such barley sold by grade, therefore, the usual premiums paid for malting barley would be lost, and even in case of consigned barley sold by sample the grading and certification of such barley as Barley instead of Malting Barley would tend to depreciate the bids.

Under the proposed dockage system, however, the numerical grade of all barley would be determined without reference to the separable foreign material, so that if the barley itself is of malting type its value for malting purposes would be revealed by the grade designation, thus directly and definitely to evidence the relationship between the quality of any given lot of barley and the quoted market premiums for malting barley whenever such premiums are available. In case of malting barley the price deductions on car-lot shipments based on dockage assessments are to be preferred over the possible loss in grade and premiums that would often result from the determination of grade according to the percentage content of separable foreign material.

Proposed Special Grades Bright and Stained

The proposed standards for eastern barley (Barley, Class I) would eliminate the grade factor "condition and general appearance" of the present official standards and in lieu thereof would adopt two special grades, namely, Bright and Stained, which grades, when applicable, would be included in, and made a part of, the grade designations, as for example: No. 2 Bright Malting Barley, or No. 1 Barley, Stained. The proposed grade Bright is defined to include barley, except bleached barley, that is of good natural color, and the proposed grade Stained is defined to include barley that is badly stained or weathered. Thus, the straight, unqualified numerical grades for barley (i.e. No. 1 Barley, No. 2 Barley, etc.) would include barley that is slightly stained, or slightly weathered, or stained.

This proposed revision, and the principal reasons for its recommendation, are discussed in detailed in a chapter entitled "General Appearance Factor—Oats, Feed Oats, Mixed Feed Oats, Barley, and Grain Sorghums" on page 142 of this report. Only certain phases of this subject, therefore, which are of special interest in barley grading are here discussed.

The proposed grade Bright would differentiate that small part of the market receipts of eastern barley which has a "good natural color" sometimes described as "creamy white color." Such color is associated with the fancy types of malting barley for which special premiums are often available when such barley is otherwise of good malting quality. Thus, this grade should serve a useful purpose as the basis for definite market premiums for malting barley of fancy color, and to bring out premiums, when available, for producers and country shippers.

The proposed grade Stained would differentiate another small part of the market receipts of eastern barley which, in years of unfavorable weather at harvest time, becomes badly stained or weathered. The inclusion of badly stained or weathered barley in the special grade Stained insures deliveries of barley under the straight, unqualified, numerical grades which contain no threat of weather damage greater than stained or slightly weathered. Furthermore, when barley of the subclass Barley (subclass *b*) of the proposed standards is badly stained but otherwise of No. 2 grade quality, for example, its value for feed purposes is portrayed much better by such proposed grades as No. 1 Barley, Stained, and No. 2, Barley, Stained, than by the present official grade No. 4 Barley (fifth grade in rank), in which latter grade badly stained barley now falls according to the "general appearance" specifications of the present official standards.

Only a minor part of the market receipts of eastern barley would be graded normally under the provisions of the proposed special grades Bright and Stained. Investigational data based on about 800 samples of the market receipts of eastern barley of the 1932 crop, obtained principally from Minneapolis, Chicago, Milwaukee, and St. Louis, show that approximately 3 percent of these receipts were graded under the provisions of the proposed special grades Bright and Stained.

Special Grades for Blighted Barley Adopted and Made Effective July 21, 1933

The official standards for barley, originally promulgated in 1926, were amended in 1933, effective date July 21, 1933, to include a special grade for Blighted barley (so-called "scabby barley"). By the terms of this amendment, all barley containing more than 2 percent but not more than 5 percent of barley damaged or materially discolored by blight and/or mold, is graded as Blighted, and the word "Blighted" is included in, and made a part of, the complete grade designation, as for example: No. 2 Barley, Blighted. By the further terms of this amendment the specifications for Sample grade were so amended as to include barley which contains more than 5 percent of barley damaged or materially discolored by blight and/or mold. These specifications for the grading of blight-damaged barley are incorporated in the complete set of proposed barley standards included in this report, and are applicable to all classes of barley, although in practice they are applicable but rarely to western barley because blight damage is uncommon in barley produced west of the Great Plains area.

For those producers, country shippers, and members of the grain trade who did not participate in the conferences and discussions which preceded the promulgation of the special grades for blighted barley there is presented herewith a summary of the reasons for their adoption into the official standards for barley.

The barley crops produced in the Middle Western States suffer damage in varying degree from year to year from several parasitic molds. During the middle to the latter part of the growing season for barley, these minute parasitic fungi (molds) often develop on the immature kernels of barley. If the infection is extensive, and if climatic conditions are favorable, these parasitic growths may attack many kernels and may penetrate the kernels so deeply as to destroy the vitality of the germ and cause the starchy part of the kernels to

decay. In other cases the infection may be comparatively late and the climatic conditions unfavorable for the extensive development of these molds, in which event the parasitic growths may damage only the exterior part of the barley kernels and leave the germ and the starchy part of the kernel undamaged or only slightly damaged.

Usually these injurious molds are more prevalent and cause greater damage in the barley crops of the Corn Belt area than in the barley crops produced in the northern and western districts of the Central States area. It is in the Corn Belt, also, that the parasitic fungus known as the scab fungus (*Gibberella saubinetii*) often infects barley extensively, which fungus, and closely related fungi, among all the various molds, cause the greatest damage to the barley kernels.

The principal reason for the comparatively greater blight damage in the barley crops of the Corn Belt area is that the scab organism (*Gibberella*) goes through the winter period of its life cycle more successfully on old cornstalks and stubble than on other forms of stubble and vegetation. Hence when barley is sown on disked corn-stubble land or on land adjoining old cornfields, favorable conditions are provided for a virulent infection of the barley crop. Also the comparatively warm and humid climate of the Corn Belt area is more favorable for the growth of the mold organisms on the barley crop than the comparatively cool and dry climates of the northern and western districts of the Central States area. In the Corn Belt area the infection of barley crops with mold fungi may be held in check materially by sowing barley on fall plowing instead of on disked corn stubble and by sowing the crop on fields not closely adjacent to old cornfields.

Barley that has been damaged by these mold fungi to any material extent has had its utility value lowered for malting purposes, because the kernels so damaged often will not germinate and be converted into malt, and because the blight-damaged kernels may infect sound kernels during the malting process. Some of the maltsters contend, also, that the quality of malt products is injured when malt is produced from barley which contains any material quantity of kernels infected with the true scab fungus.

Barley that contains a material quantity of kernels damaged by the true scab fungus, which fungus is common in the blight-damaged barley crops of the Corn Belt area, has had its feed value lowered for hog-feeding purposes. At times, and in certain producing areas, blight-damaged barley, in which the scab fungus is prevalent, is so toxic in character as to cause hogs to vomit when they eat it. Some blight-damaged barley, in which the scab fungus is prevalent, may not be sufficiently toxic to cause hogs which eat it to vomit but the damage may be such as to make the barley so unpalatable that hogs refuse to eat it, or, if eaten, to lose weight or to make no gains in weight. Other kinds of livestock do not react similarly to blight-damaged barley when it is fed to them, although horses will not eat scabby barley. Feeding experiments have shown that cattle and sheep, especially, will eat blight-damaged barley that would be of low value for hog-feeding purposes and suffer no injurious effects from it.

Although the toxic quality in blight-damaged barley that causes hogs to vomit varies from year to year and as between the crops produced in different localities, investigational work of the last 5 years pertaining to blight-damaged barley, and to its effect on hogs when fed, has shown that, by and large and in the majority of years, there

are not many lots of barley containing a quantity of blight-damaged kernels as great as 3 to 4 percent by weight that are sufficiently toxic in character to cause hogs to vomit. In occasional years, however, when the true scab fungus (*Gibberella saubinetii*) is widespread and virulent, the toxicity of barley containing as much as 3 to 4 percent by weight of blight-damaged kernels may be so great as to cause hogs which eat it to vomit or at least to make little or no gains in weight.

These facts about blight-damaged barley, merely summarized above, were employed during the fore part of the year 1933 in formulating the specifications for the special grade Blighted barley and the amended specifications for Sample grade in the present official standards for barley. In succeeding paragraphs the quantities of blight-damaged kernels permitted in the straight numerical grades, in the special grades for Blighted, and in Sample grade, barley, are interpreted and discussed for the purpose of indicating the relations which the respective grade limitations have with the utility values of market barley.

The proposed subclass Malting Barley, and each of the proposed five unqualified numerical grades for barley of the proposed subclass Barley (Class I) and of the proposed class Western Barley (Class III), may contain a quantity of blight-damaged kernels as great as 2 percent by weight.

With the maximum quantity of blight-damaged kernels limited to 2 percent in the proposed subclass Malting Barley, all grade certificates for malting barley of grade No. 1, or No. 2, or No. 3, would guarantee that no contract delivery of malting barley could contain more than 2 percent of this objectionable form of damage. This quantity of blight damage is considered by the malting barley trade to be the approximate maximum quantity that should be tolerated in malting barley deliveries by grade.

In case of feed barley, this maximum limitation of 2 percent blight-damaged barley in each of the straight numerical grades is an assurance, for practical commercial purposes, that barley certificated as No. 1, No. 2, No. 3, No. 4, or No. 5 Barley, does not contain a sufficient quantity of blight-damaged kernels to cause a hazard in the feeding of such barley to hogs or to any other kind of livestock. From a scientific point of view the 2 percent maximum limitation on blight damage does not constitute an absolute ironclad guarantee that barley containing 2 percent blight damage would never, under any circumstances, be sufficiently toxic to be injurious to hogs. The possibility, however, that such barley would be hazardous for hog-feeding purposes is so remote as to be practically negligible in the commercial handling of barley.

The special grades for blighted barley apply to all barley containing more than 2 percent but not more than 5 percent by weight of barley damaged or materially discolored by blight and/or mold. The proposed requirements for the subclass Malting Barley, however, would specifically exclude, blighted barley from this subclass. This special grade, therefore, under the proposed barley standards, would be applicable only to so-called feed barley.

Barley graded and certificated as Blighted, in connection with any numerical grade would, under all known facts about the feeding qualities of barley, contain no hazard for the feeding of all kinds of

livestock other than hogs and horses. Also, in many years when the toxicity of the true scab fungus is not high, or in case of blight-damaged barley which contains but little true scab damage, barley graded and certificated as Blighted in connection with any numerical grade, would contain no hazard for hog feeding. In some years, however, when there are virulent epidemics of true scab fungus damage in the Corn Belt area, and when the toxicity of such damage is high, barley graded under the provisions of the special grade Blighted might be hazardous for hog-feeding purposes. The pre-harvest scab surveys usually made by the United States Department of Agriculture and the State agricultural experiment stations in the important barley States, provide valuable information as to the probable commercial hazards in the utilization of Blighted barley from any given crop from the respective important areas of production.

Although barley that comes under the provisions of the special grade Blighted could not be graded and certificated as Malting Barley under the proposed standards, there would be some car lots of barley graded, for example, as No. 1 Barley, Blighted or No. 2 Barley, Blighted under the proposed standards, that would meet the requirements for Malting Barley except as to blight damage. Such car lots of barley that would not be deliverable on contracts by grade for malting barley would often find a sale to maltsters by sample, especially in those cases where the blight-damaged kernels are shrunken in size and removable from the barley by commercial sieving operations.

With respect to barley which contains more than 5 percent of blight-damaged kernels and which, therefore, would be graded Sample grade under the amended barley standards effective July 21, 1933, it may be said that such barley would usually be given no consideration for malting barley on even a sample basis of trading, although occasional exceptions to this statement are possible. For livestock-feeding purposes, such barley might often have good value for the feeding of cattle or sheep, but in case of hogs it would be a hazardous product in many cases, especially for barley produced in the Corn Belt area where the true scab fungus is more prevalent than in the northern and western districts of the Central States barley area.

In all public consideration of these grade specifications for Blighted barley, it should be kept in mind that the maximum limitations of 2 percent (for straight numerical grades) and 5 percent (for special grade Blighted) are based on maximum quantities of blight-damaged kernels which are inseparable in some lots of barley. In many car lots of country-run barley, however, which contain blight-damaged kernels, the kernels so damaged are shrunken and of a size, therefore, that makes many of them easily separable from the sound and relatively plumper kernels. For these reasons the actual commercial hazards in the handling and utilization of blight-damaged barley may be reduced materially in many cases below the hazards previously indicated, wherever blight-damaged barley can be commercially screened.

While inspection data from the important barley markets are not yet available to indicate the exact percentages of market receipts that will grade into the straight numerical grades, into the special grade

Blighted, and into Sample grade, under these grade requirements for blight damage, it is known in a general way from experience and observation that, for barley produced in the northern and western districts of the Central States, the vast majority of the barley receipts will fall into the straight numerical grades, a small percentage will fall into the special grade Blighted, and an extremely small percentage will grade Sample grade. In case of barley produced in the Corn Belt area, however, where blight damage is more common than in the other important barley-producing areas, it may be expected that there will be a material commercial volume of barley that will grade Blighted (more than 2 percent but not more than 5 percent blight damage), and a relatively smaller volume that will grade Sample grade (more than 5 percent blight damage), although the average bulk of the market receipts will probably come within the blight damage tolerance for the straight numerical grades (2 percent or less).

Summary of Improvements Proposed in Standards for Eastern Barley (Barley, Class I)

The Bureau is confident that the proposed standards for eastern barley (Barley, Class I) constitute an improvement over the present official standards. They should meet domestic barley users' requirements for both malting barley and feed barley better than the present official standards, and should function to distribute the total value of market barley more equitably among producers and country shippers. The proposed grade requirements are such as to distribute the market receipts of barley among the various grades in a manner that would cause a practical trading volume of barley to be available in each of the first four numerical grades, and further to cause the grades to conform well with the natural gradations in quality that are common in country-run barley.

The Bureau has made a study of the application of the present official standards for eastern barley and of tentative, revised standards which are nearly identical with the proposed standards for eastern barley (as given on page 27 of this report), to about 800 samples of eastern barley of the 1932–33 crop obtained principally from Minneapolis, Chicago, Milwaukee, and St. Louis. From this study the following data are illustrative: Under the present official standards about 1 percent of these samples graded No. 1, about 39 percent graded Special No. 2 (second grade), about 4 percent graded No. 2 (third grade), and about 26 percent graded No. 3 (fourth grade); whereas under the experimental standards that were nearly identical with the proposed, revised standards, about 18 percent of these samples fell into the straight grade No. 1, about 21 percent fell into straight grade No. 2, about 13 percent fell into straight grade No. 3, and about 15 percent fell into grade No. 4.

While the data from 800 samples from one crop may not be sufficient to indicate accurately the percentages of the total market receipts of eastern barley which, through a period of years, would fall into the respective numerical grades of the proposed standards for eastern barley, they are sufficient to indicate that the market receipts would be spread among the first four important numerical grades in a much better proportion for commercial purposes under the proposed standards than under the present official standards.

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WESTERN BARLEY STANDARDS

Several important revisions of the standards for Western Barley are recommended in the proposed standards, the principal purpose of which are to correlate these standards with consumers' requirements and trade practices in the Pacific coast markets for feed barley more closely than do the present official standards. The proposed standards for Western Barley, therefore, make no attempt to provide grade requirements that correlate with the malting qualities of barley, although barley that would meet the requirements of the top grades of these proposed standards might incidentally qualify for malting barley in some particulars.

It is recommended in the proposed standards for Western Barley that relative quality for feed barley should be expressed (1) by numerical grades based on the factors of sound kernels, heat-damaged kernels, wild oats, foreign material, broken kernels, and Black Barley; (2) by a special grade entitled Test weight of Western Barley, which would be included in complete grade designations, and which would express the quality of Western Barley according to the important individual factor of test weight per bushel; and (3) by other special grades such as those for Bright, Stained, and Tough barley.

Thus, in lieu of the present method of using test weight per bushel as a factor for the determination of numerical grade in the class Western Barley, the test weight per bushel, in terms of whole pounds, would be included as a separate item in the complete grade designation assigned to each lot of such barley, as for example: No. 1 Western Barley, 46 pounds; No. 1 Western Barley, 40 pounds; No. 3 Western Barley, 46 pounds, etc.

The proposed use of special grades for Tough, Bright, and Stained barley in lieu of the moisture, subclass, and general appearance specifications of the present official standards for Western Barley, is discussed in this report in the sections entitled "Moisture Content" and "General Appearance Factor—Oats, Barley, . . ."

The studies made by the Bureau of the use and application of the present official standards for Western Barley, since their promulgation in 1926, indicate the usefulness and desirability of these proposed major revisions of the barley standards and of other minor revisions that may be observed in the proposed standards for Western Barley. The principal reasons for the proposed revisions are given in succeeding paragraphs.

Principal Market Requirements for Western Barley

Exclusive of malting barley, the market demand for barley in the Pacific coast area is for sound, clean barley, of both relatively high and low test weight for either grinding, or for steaming and rolling, for feed purposes. Price differentials usually exist between the high-test-weight and low-test-weight types. A material quantity of of the light-weight type of barley that goes into commercial channels for feed purposes is not a naturally produced type but is a sized and prepared type which results from the so-called "Jessuping" (sizing) process that is followed in the preparation of barley for sale to the malting-barley trade. This relatively light weight (approximately 40 to 42 pounds per bushel) but sound and clean type of Western Barley is of such importance in the Pacific coast barley trade that it is the

basis for futures contracts and other contracts at San Francisco and Los Angeles.

The relatively heavyweight type of barley above mentioned is fairly well represented by grades No. 1 and No. 2 of the present official standards for Western Barley, but there are no grades of the present official standards which represent, with respect to all grading factors, the commercially important, relatively lightweight type. While grades No. 3 and No. 4 of the present official standards meet the trade requirements for this type of barley as to test weight, they permit quantities of unsound kernels, broken kernels, wild oats, and foreign material, that are too great to meet trade requirements for a type of of barley that is sound and clean although of low test weight per bushel. In other words, a grade to meet these commercial requirements should guarantee top grade quality as to such factors as sound kernels, wild oats, and foreign material, in conjunction with a relatively low test weight per bushel requirement as well as in conjunction with a relatively high test weight per bushel requirement.

Western Trade Practices With Reference to Test Weight

There is a wide range from approximately 36 to 50 pounds in the test weight per bushel quality of barley produced in the States west of the Great Plains area. This wide range is more common in commercial lots of western barley than in eastern barley. For this reason, as well as because of the specialized market requirements previously mentioned, the practice of designating the test weight of barley separately from the numerical grade designation has been established in trade practice and local inspection procedure in the Pacific coast area for many years. Thus, some of the important contract barley specifications in the Pacific coast markets have been and now are expressed in the following terms: Portland, No. 2 Barley, 45 pounds; San Francisco, No. 2 Barley, 40 pounds; and Los Angeles, No. 2 Barley, 42 pounds. Market quotations commonly are made and published on the basis of such contract specifications, or other specifications in which the individual factor of test weight per bushel is separately specified.

Although much of the barley produced in California, Nevada, and Arizona is of a different type and is commonly threshed more loosely than the barley of Oregon, Washington, Idaho, and Montana, the trade practice of designating the test-weight factor separately has been in effect for many years in all the principal barley markets west of the Great Plains area. For this principal reason it appears desirable to incorporate in the standards for western barley the method for designating test-weight values separately in the grade designation.

Contract Grades and Trade Rules for Western Barley

Under the proposed standards for Western Barley, it would be possible for any grain exchange, or for individual buyers and sellers, in the area of western-barley production and inspection, to select any numerical grade, supplemented by any special grade (such as Bright) and by any test-weight-per-bushel specification, which, when combined, would be expressed in a complete grade designation to be used in commercial transactions and for grain storage purposes. Similarly grain exchanges could select such complete grade designations as they

might desire for futures trading. The necessary flexibility in contract grades would thus be assured to cover the variations in barley quality and consumer requirements in the marketing of Western Barley. Furthermore, it should be noted, that in accordance with market requirements and existing trade practice, the proposed standards would facilitate the formulation of price differential schedules for such Western Barley as would not be included in the contract grades.

RED DURUM CLASSIFICATION

The recommendation is made in the proposed standards for durum wheats to establish separate classes for common durum and for Red Durum, in lieu of the present class Durum wheat which includes Red Durum as a subclass. These proposed classes are entitled Durum wheat and Red Durum wheat. The proposed class Durum wheat includes all varieties of durum wheat except Red Durum, and the proposed class Red Durum wheat includes all varieties of Red Durum. Each of these classes may include not more than 10 percent of other wheat or wheats.

Commercial utilization of Red Durum wheat is so distinctly different from that of common durum wheat that the Bureau believes it desirable to establish separate classes for each of these types of wheat. The principal use for common durum wheat is in the manufacture of semolina flour, for which purpose Red Durum wheat is of relatively low value. In former years there has been a considerable demand for Red Durum wheat to use as a mix in common durum and other wheats of the important contract grades. This use for Red Durum would be curtailed materially by the adoption of the proposed revised standards for hard red srping, hard red winter, soft red winter, white, and common durum wheat, in which the limitations on Red Durum have been sharply restricted in the top grades. The principal uses hereafter for Red Durum, therefore, would be for mixing purposes with common durum in the preparation of export lots of Mixed Durum wheat, and for use as a component part of the manufactured feeds for poultry and livestock, or as a direct feed for poultry, or in the manufacture of breakfast foods. For such commercial purposes, Red Durum wheat would be graded and designated more definitely and usefully under the proposed class for Red Durum than under the present subclass for Red Durum in the official standards for all durum wheat.

Under the present official standards for durum wheat (Durum, Class II), any wheat of the class Durum which contains more than 10 percent of Red Durum is graded and designated as Red Durum. Thus, the grade designation No. 2 Red Durum, for example, may apply to a lot of durum wheat that is 100 percent Red Durum or to a lot that is only 11 percent Red Durum and 89 percent common durum. Such grade designations, therefore, are indefinite guarantees of quality with respect to Red Durum, and are inequitable, in fact, for those lots of durum wheat which consist of relatively high percentages of amber durum wheat.

Under the proposed standards for the class Red Durum, no wheat designated as Red Durum could contain more than 10 percent of wheats other than Red Durum. Furthermore, those mixtures of Red Durum with common durum which contain more than 10 percent

common durum, would be designated definitely as either Mixed Durum or Mixed Wheat, as the case might be, thus providing buyers and sellers of grain with more definite grades for such mixtures than those provided by the present subclass Red Durum.

In connection with the proposed class for Red Durum wheat it may be observed that the specifications for Mixed Durum have been revised in such a manner as to provide for mixtures of common durum and Red Durum which may contain a maximum quantity of Red Durum, approximately the same as that allowed in the present grades for Mixed Durum.

DURUM WHEAT SUBCLASSES

The recommendation is made in the proposed standards to revise the subclasses for common durum wheat by dividing the subclass Durum of the present official standards into two subclasses entitled Durum, consisting of 50 percent or more but less than 75 percent of hard and vitreous kernels of amber color, and Soft Durum, consisting of less than 50 percent of hard and vitreous kernels of amber color. The present official subclass Amber Durum, consisting of 75 percent or more of hard and vitreous kernels of amber color, would remain unchanged. Thus, the market offerings of common durum wheat would be divided into three parts (Amber Durum, Durum, and Soft Durum), according to amber kernel texture, instead of into two parts (Amber Durum and Durum) as is now the case under the present official standards. The basic contract grade under the proposed standard doubtless would be the same as under the present official standards, namely, No. 2 Amber Durum.

The Bureau believes that this proposed classification of common durum wheat would be of value in both the domestic and export marketing of durum wheat, and that any increase in the number of bins necessary to handle and store durum wheat under this classification is fully justified.

Purposes of Proposed Subclasses Amber Durum, Durum, and Soft Durum

There are two principal reasons for the Bureau's recommendation to divide the present subclass Durum into two subclasses, namely, Durum, and Soft Durum. The first reason is that in most years a material segment of the country-run receipts of common durum wheat does not meet the kernel texture requirements of the present premium subclass Amber Durum (75 percent or more of hard, amber kernels) and is, therefore, included in the subclass Durum of the present official standards. According to data compiled from the inspections of durum wheat made by licensed inspectors at all United States markets for the 7-year period 1925–26 to 1931–32, inclusive, the average crop of durum wheat (other than Red Durum) consisted of approximately 48 percent of wheat which classified as Amber Durum and 52 percent which classified as Durum. The percentage range in the receipts of durum wheat of the subclass Durum was from a low of approximately 7 percent in the crop year 1931–32 to a high of 90 percent in the crop year 1928–29.

The range of amber kernel texture quality is from zero to 74 percent in the present official subclass Durum, which quality range is too wide to properly differentiate the utility values in the large volume of durum wheat that is included in this subclass. While data are not

available to indicate the exact volume of durum market receipts of the present subclass Durum which falls into the upper part of the texture quality range of that subclass, it is well known from the observation and experience of the Federal grain supervisors at the important durum wheat markets that a large majority of the country-run receipts of common durum which cannot classify as Amber Durum (75 percent or more of hard, amber kernels) contains 50 to 74 percent of hard, amber kernels.

Under the present official standards, therefore, the large volume of country-run receipts of relatively superior quality durum wheat within the subclass Durum are lumped off in the same subclass with a minor portion of the receipts that is of relatively inferior kernel texture quality and that is of distinctly inferior value for the manufacture of semolina. Thus, in marketing durum wheat by grade only the discounts often are severe and inequitable for those lots of durum wheat that are not quite good enough in texture quality to classify as Amber Durum under the present official standards, but which have distinctly superior quality for the manufacture of semolina as compared with other lots of durum wheat of the subclass Durum which contains relatively small percentages of hard, amber kernels.

The proposed new subclass specifications for common durum wheat would remedy this weakness in the present official standards and would differentiate and emphasize the relative utility values in common durum wheat for semolina manufacture in a manner that may be expressed popularly as "good", "fair", and "poor", instead of the present quality descriptions which may be likened to "good" and "poor to good". It is logical to assume that under the tentative standards, market prices would tend to be distributed more equitably than under the present official standards, and that the proposed subclasses would be useful to buyers and sellers in those transactions that cannot be negotiated on the sample-trading floors.

Proposed Subclasses Should Be Useful In Export Commerce

The second reason for dividing the present subclass Durum into two subclasses Durum and Soft Durum, is that the available evidence indicates that the proposed subclass Durum, specifying 50 percent or more but less than 75 percent of hard, amber kernels should facilitate the exporting of United States durum wheat to European countries, especially to France and Italy. In these countries the semolina millers and macaroni manufacturers know and appreciate high quality durum wheat. They recognize the difference in quality between so-called Federal No. 2 Amber Durum (meaning a United States appeal grade), which guarantees a delivery of durum wheat consisting of 75 percent or more hard, amber kernels, and so-called Seaboard No. 2 Amber Durum, which, because a material part of the exports of United States durum wheat is made through Canadian ports under eastern Canadian inspection, often represents deliveries which are relatively inferior with respect to one or more of the several grade factors, including percentage of hard, amber kernels. Thus, when world competitive prices are such that European buyers are in the market for United States durum wheat they often bid 3 cents or more per bushel more for Federal No. 2 Amber Durum than for Seaboard No. 2 Amber Durum.

As a general rule, however, the French and Italian millers cannot and do not compete with our domestic semolina millers for the choicest part of our durum wheat crops. The manufacture of semolina products is on the increase in the United States and the domestic mill demand is strong for the superior grades of durum wheat. Thus, the export price on genuine No. 1 or No. 2 Amber Durum, under the present official standards, is often too high for the French and Italian millers. In Italy the retail selling price on macaroni products is commonly fixed by municipal governments, thus forcing the millers often to seek relatively cheap durum wheats or to use mixtures of so-called "soft wheats" (wheats other than durum). Both Italy and France are often able to purchase satisfactory grades of Russian and North African durum wheat at prices below those which commonly prevail in the United States for durum wheat having 75 percent or more of hard, amber kernels. Thus, although the French and Italian millers know and appreciate the potential semolina value of our high-grade durum wheat they are not now, nor are they likely to be, important customers for our durum wheat which has a high percentage of hard, amber kernels.

It is believed, therefore, that our export trade in durum wheat would be aided by a subclass that would guarantee the European miller of semolina a delivery of "fair quality" Amber Durum wheat such as that represented by the proposed grades of either No. 1 or No. 2 Durum (50 percent minimum of hard, amber kernels), which grades of wheat would not be subject to as strong a domestic demand as wheat of the grades No. 1 and No. 2 Amber Durum, and which therefore, would be attractive in price to European millers. The grades of durum wheat of the proposed subclass Durum, properly applied under United States Federal grain supervision would, as a matter of fact, represent as good or better deliveries of durum wheat than those now represented by what the European trade calls "Seaboard No. 2 Amber Durum", because of the new restrictions on Red Durum, total damage, and unnatural material, that are recommended in the proposed standards for durum wheat.

For those European buyers who want a type of durum wheat superior to that represented by the proposed grade No. 2 Durum, and who are willing to pay the price necessary to compete with domestic semolina millers for such wheat, the proposed grades of No. 1 and No. 2 Amber Durum would meet such export requirements.

Under the present official standards for durum wheat it is a practical impossibility for United States exporters to employ any official grade for durum wheat, in the "North American contract" and certificate final system of exporting wheat, that represents a quality lower than that of No. 2 Amber Durum, because the range of kernel texture quality in the present subclass Durum is from zero to 74 percent. Thus, foreign millers cannot be expected to contract, under the present subclass Durum, for a delivery that the seller could fulfill with durum wheat of a highly starchy quality. There is good reason to believe, however, that the proposed grade of No. 2 Durum which would guarantee a minimum texture quality of 50 percent hard, amber kernels, not over 4 percent total damage, not over 1 percent matter except other grains, not over 14.5 percent moisture, not over 5 percent Red Durum, not over 0.3 percent unnatural material, and not over

0.9 percent unassessed dockage, could be merchandised in the export trade under the provisions of the "North American contract."

WHITE WHEAT SUBCLASSES

The proposed standards for white wheat would (1) establish a new subclass entitled "White Club" that would include white wheat of the White Club and/or Sonora varieties containing not more than 10 percent of common white wheat other than Sonora, and would (2) revise the specifications for the present official subclass Western White so that it would include only those mixtures of white wheat which consist of more than 10 percent of White Club and/or Sonora wheat together with more than 10 percent of common white wheat other than Sonora. The present official subclasses Hard White and Soft White would be continued without any revision of their specifications.

It is believed that the proposed subclass White Club would give more definite recognition to both the domestic and export requirements for White Club wheat,[41] that it should function to establish market quotations for White Club wheat on a more definite basis, and that it should reflect market prices more equitably to producers, than is possible under the specifications of the present official subclass Western White, which may include either pure White Club or mixtures of White Club and common white wheat.

Proposed Subclass White Club

Normally, white wheat of the varieties White Club and Sonora, as produced in the Intermountain and Pacific Coast States, is a relatively soft, starchy, low-protein wheat, although some commercial lots of such wheat are relatively hard in kernel texture and of moderately high protein content, due to their production under environmental conditions that are especially favorable for the development of a hard type of wheat. Normally, also, White Club wheat has a higher test weight per bushel and has a better general appearance when washed than the common white wheats. These purely physical qualities of White Club wheat are of advantage to exporters and processors in the blending of white wheats for export or for domestic milling. For these various reasons the country-run lots of White Club wheat are often binned and handled separately in commercial practice prior to their utilization by exporters or millers.

White Club wheats always have been in demand in the export trade with Ireland and England where the flour made from them has been favored for scone and biscuit baking. In domestic milling, material quantities of White Club wheat are blended with the common white wheats in the manufacture of flour intended for export to the Orient or in the manufacture of a general-purpose type of flour for domestic sale. Also there are specialized demands for White Club wheat for use in the manufacture of specialized types of flour for cracker, pastry, and breakfast-food products.

Although the country-run lots of white wheat in the Pacific coast area that are now being graded under the present official subclass Western White are very largely pure or nearly pure White Club wheat, the present official subclass Western White permits anywhere

[41] The term "White Club wheat" is used in this discussion to denote wheat of the White Club and/or Sonora varieties, and the term "common white wheat" to denote all varieties of common white wheat except Sonora.

from 11 to 100 percent of White Club and/or Sonora wheat, because the subclass specifications for Western White read "wheat of the class White consisting of more than 10 percent of the varieties White Club and Sonora." Thus, the pure country-run White Club wheat, which is often handled and utilized separately in commercial practice, is classified by grade in the same category with the mixtures of White Club and common white wheat that are usually artificial mixes made up for some of the export and domestic deliveries.

This inclusion, under the present official standards, of pure or nearly pure White Club wheat in the same category (Western White) with elevator mixes of White Club and common white wheat does not harmonize with usual trade practices, does not provide domestic and foreign buyers with a definite grade for White Club wheat for use as a contract specification, and may prejudice the interests of the producers of White Club wheat at those times when there are special demands for such wheat, because the price of pure White Club at country points is based on elevator mixtures of White Club and common white wheats.

Under the present official standards, domestic millers and foreign wheat buyers cannot contract for pure or nearly pure White Club and/or Sonora wheat by grade alone to be evidenced by official inspection, because the official standards do not provide grades for such wheat that guarantee a relatively high percentage of these varieties in the delivery. Hence, in the merchandising of wheat on the basis of the present official standards, the buyers who desire White Club wheat must purchase either by both grade (Western White) and sample specifications, or by grade (Western White) together with a supplementary specification for the percentage of White Club to be made in the delivery, in which latter event inspection departments usually are requested by interested parties to determine the percentage of White Club wheat and to note the information on certificates under Remarks in order to evidence the fulfillment of the contract specifications.

The insufficiency of the present official standards for white wheat in these respects would be remedied by the adoption of the proposed subclass for White Club that would include only those lots of White Club and/or Sonora wheat containing not more than 10 percent of common white wheat, thus guaranteeing to domestic millers and foreign buyers who wish to purchase such wheat by grade a delivery of pure or nearly pure White Club and/or Sonora wheat. This proposed subclass would conform to mill requirements and trade practices in the handling of White Club wheat better than the present official subclass Western White, and would provide a much more definite basis for trading than that of the grade designation Western White.

Proposed Subclass Western White

The subclass Western White in the proposed standards for white wheat would include only those admixtures of White Club and/or Sonora wheat and common white wheat other than Sonora which would not meet the requirements of any of the other subclasses for white wheat. Specifically it would include white wheat of the class White which contains more thn 10 percent of White Club and/or Sonora wheat and which contains also more than 10 percent of com-

mon white wheat other than Sonora. It would represent usually a type of wheat, therefore, for the manufacture of a general-purpose type of flour.

The present official subclass Western White has become established as an important grade in the Pacific export trade. The use of this well-known grade term could be continued in commercial transactions under the proposed standards for the purpose of designating the quality and condition of mixtures of White Club and common white wheats.

The partition of the present official subclass Western White into the two proposed subclasses White Club and Western White, should increase the confidence of both domestic and foreign buyers in the standards, and should facilitate the commerce in white wheat by grade, because the proposed subclasses White Club and Western White conform to mill requirements and trade practices better than the single official subclass Western White. There have been instances in the past where foreign buyers have contracted by grade for Western White wheat expecting to receive deliveries that would consist of a relatively high percentage of wheat of the White Club type, but who were delivered Western White wheat consisting of a relatively high percentage of common white wheat other than Sonora of hard texture because of the then prevailing domestic premiums on wheat of the White Club type. Also there have been other years in the export trade when domestic premiums prevailed for Hard White wheat when the deliveries made under the official subclass Western White consisted of a relatively high percentage of White Club and/or Sonora wheat. The proposed subclasses White Club and Western White should function to obviate such buyers' difficulties and dissatisfaction with the deliveries or with the standards because the proposed subclasses would provide both domestic and foreign buyers with the means for specifying in more definite terms the types of wheat desired.

New Subclass for Extra Soft White Has Been Suggested to Bureau

It has been recommended to the Bureau that the present official subclass Soft White in the standards for white wheat should be divided into two subclasses, namely, Extra Soft White, and Soft White. Under this proposal the suggested subclass Extra Soft White would include common white wheat consisting of 75 percent or more of soft and chalky kernels; while the suggested subclass Soft White would include common white wheat consisting of both less than 75 percent of soft and chalky kernels and less than 75 percent of hard kernels. (Possibly the specifications for Extra Soft White would be either 60 or 65 percent of soft kernels in case the 75 percent specification should be found to restrict the volume of Extra Soft White to an impractically small volume for commercial purposes.) A maximum quantity of 10 percent White Club and/or Sonora wheat would be tolerated in each of these suggested subclasses, as is now the case in the official subclass Soft White.

The suggested subclass Extra Soft White would, therefore, include only those lots of common white wheat which consist of a relatively high percentage of soft and chalky kernels, while the suggested subclass Soft White would include only those lots of common white wheat that are neither distinctly soft nor distinctly hard in kernel

texture character. In the Pacific coast area, the greatest part of the wheat that would classify usually as Extra Soft White would be wheat of the varieties Federation, Fortyfold, and Dicklow, although in some seasons a small part of the production of wheat of such varieties as Hard Federation and Bunyip would be of sufficiently soft kernel texture to be included also.

The principal objective in this plan that has been suggested to the Bureau for the reclassification of soft white wheat is that of establishing a definite subclass which would designate a superior type of white wheat for the milling of the so-called "pastry type" of flour. The advocates of this suggested subclass (Extra Soft White) believe that it would facilitate the merchandising of this extra soft type of white wheat under contracts by grade as between the interior shipping points and the Pacific coast terminals, between Pacific coast markets and the soft-wheat millers of the Middle Western and Eastern States, between the North Pacific coast terminals and the California millers, and between the Pacific coast markets and the European wheat importers. It is believed further by the advocates of this suggested subclass that, if adopted, it would establish a base for regular market quotations on this special type of soft white wheat whereby the mill demands for such wheat would be reflected in more equitable price differentials than those which now prevail under the present official subclass Soft White which covers a relatively wide range of quality according to kernel texture, and in which this special type of white wheat is now included.

New Subclass for Pacific Hard White Has Been Suggested to Bureau

Another suggestion has been made to the Bureau for further revision of the subclasses for white wheat, namely, that the present official subclass Hard White be divided into two subclasses that would be entitled Pacific Hard White and Hard White. The suggested subclass Pacific Hard White would include common white wheat possessing the characteristics of the varieties Baart and Bluestem, as grown west of the Great Plains area, consisting of 75 percent or more of hard (not soft and chalky) kernels; while the suggested subclass Hard White would include all common white wheat, except white wheat which meets the requirements of the subclass Pacific Hard White, consisting of 75 percent or more of hard (not soft and chalky) kernels. In each of these suggested subclasses a maximum quantity of 10 percent White Club and/or Sonora wheat would be tolerated, as is now the case in the official subclass Hard White.

Were these suggestions to be adopted the additional subclass Pacific Hard White would include only common white wheat of the varieties Baart and Bluestem (and possibly other future varieties which might be recognized to have comparable characteristics), grown west of the Great Plains area, and consisting of 75 percent or more of hard-textured kernels, while the subclass Hard White under such a classification, would include all common white wheat grown anywhere in the United States which consists of 75 percent or more of hard-textured kernels, but which would not meet the requirements for the subclass Pacific Hard White. In practical effect, therefore, these suggestions would merely segregate the Baart and Bluestem wheat of the Pacific coast area, which is of relatively hard texture, in a special subclass.

The principal objective in this plan that has been suggested to the Bureau for the reclassification of hard white wheat is to establish a definite subclass for those varieties of common white wheat grown west of the Great Plains area which, when of relatively hard texture, possess well-recognized superior quality for the milling of the bread-making type of flour.

Usually the Pacific coast flour mills pay a premium for hard white wheat of the varieties Baart and Bluestem, especially for that segment of the supply that is produced in or near the Big Bend area in the State of Washington. The present official subclass Hard White includes common white wheat of any variety which consists of 75 percent of more of hard-textured kernels, thus it does not function in the Pacific coast markets to designate the premium types of hard white wheat separately from the common run of such wheat. Often, therefore, special contracts for hard white wheat are made by grade (No. 1 Hard White, for example, of the present official standards), supplemented by the specifications Baart or Bluestem, as well as by specifications for the area of production, such as Big Bend. Under these methods of wheat merchandising, as conducted under the present official standards, the inspection departments are often requested to certify the variety name (Baart or Bluestem) under Remarks in certificates, when the wheat is, in fact, of these varieties.

The advocates of this suggested subclass (Pacific Hard White) believe that, if adopted, it would (1) facilitate the merchandising of hard white wheat of superior quality for the manufacture of bread flour under contracts by grade between the interior shipping points and the Pacific Coast and Intermountain States mills and between the North Pacific coast terminals and the California mills, and (2) establish a definite grade basis for regular market quotations on hard white wheat of the Baart and Bluestem type, whereby the mill demands for such wheat would be reflected in more equitable price differentials than those which now prevail under the present official subclass Hard White which includes all varieties of common white wheat, including the varieties Baart and Bluestem.

Suggested Subclasses Extra Soft White and Pacific Hard White Should Have Public Consideration

The Bureau believes that the question of adopting these suggested subclasses (Extra Soft White and Pacific Hard White) is one that should be determined on the basis of their commercial usefulness to the producers, handlers, and consumers of white wheat, when considered in connection with (1) the additional grading service that would be required of the inspection departments in the white-wheat areas, (2) the existing market practices for the domestic and export merchandising of white wheat, (3) the increasing use of the protein test as a commercial measure of the potential baking quality of wheat, and (4) the need for, and usefulness of, regularly published and definite market quotations for protein content in the white-wheat area.

The Bureau believes further that these matters should be subjected to public discussion and consideration within the white-wheat industry prior to the reaching of any conclusion with reference to the need for, and usefulness of, these suggested subclasses for Extra Soft White and Pacific Hard White wheat. At this time, therefore, the Bureau suggests that the producers, handlers, and millers of white

wheat, study these suggestions carefully and deliberately for the purpose of cooperating with the Bureau in a final determination of these questions.

HARD RED WINTER WHEAT SUBCLASSES

It is proposed in the standards for hard red winter wheat to revise the kernel-texture specifications for the subclass Dark Hard Winter from 80 percent or more of dark, hard, and vitreous kernels, to 75 percent or more of such kernels, thus making the texture specifications for this subclass identical with those of the premium subclass Dark Northern in the standards for hard red spring wheat.

When the Federal wheat standards were first promulgated in 1917, prior to the adoption of the protein test in our domestic-wheat commerce, it was thought desirable to specify a higher kernel-texture requirement for Dark Hard Winter wheat than for Dark Northern Spring wheat, in order to provide grade designations that would indicate approximately comparable potential baking quality in these two classes of wheat. But in the market and mill practices of today the use of a higher kernel texture specification for the subclass Dark Hard Winter than for the subclass Dark Northern Spring appears to serve no useful purpose.

In the first place, the research work of the cereal chemists has shown that while a relatively high percentage of dark, hard, and vitreous kernels (75 percent or more), is an approximate index of potentially good baking quality in wheat, the difference in potential baking quality between hard red winter wheat containing 80 percent of dark, hard, and vitreous kernels and hard red winter wheat containing 75 percent of such kernels is not commercially significant. Thus, the 80 percent kernel-texture specification cannot be relied on as a definite assurance of any better baking quality than that represented by a 75 percent specification. In the second place, the protein test is used widely today in our domestic wheat commerce, in lieu of kernel-texture specifications, as a measure of potential baking quality, because it is a more exact index of such quality.

For these reasons, there appears to be no logical necessity for maintaining the kernel-texture specifications of the subclass Dark Hard Winter on a higher percentage basis than the specifications of the subclass Dark Northern Spring. In both cases these subclasses are still of commercial usefulness in those trade channels where protein-testing facilities are lacking, as well as in futures trading operations, export commerce, and in the public storage and financing of the wheat crops. But for all these purposes a specification of 75 percent dark, hard, and vitreous kernels, for the subclass Dark Hard Winter, should be just as useful as the present specification of 80 percent of such kernels.

Although this proposed revision is not one of major importance, it would serve to cause a slight increase in the volume of hard red winter wheat that would be included in the premium subclass Dark Hard Winter without causing any material change in the quality of the wheat so designated, and it would serve the further purpose of placing the two chief bread wheats of the United States (hard red winter and hard red spring) on the same basis, according to kernel texture, for inspection and for market evaluation.

TEST-WEIGHT SPECIFICATIONS FOR HARD RED SPRING WHEAT

The test weight per bushel requirement for grade No. 1 is 60 pounds in each of the present official wheat classes Durum, Hard Red Winter, Soft Red Winter, and White, whereas the requirement for grade No. 1 is 58 pounds in the class Hard Red Spring. With the exception of test weight, moisture content, and the special limitations on certain other kinds of wheat, all other grade requirements for grade No. 1 are identical in all of the wheat classes of the present official standards.

Principally because of this difference in the No. 1 grade requirement for test weight per bushel, a materially higher percentage of the market receipts of hard red spring wheat is included in grade No. 1 than in the other classes of wheat. According to data from the original inspections of wheat receipts at all United States markets for the 16-year period 1917–18 to 1932–33, inclusive, the average annual percentage of the receipts of each class of wheat that graded No. 1 on all factors was as follows: Hard Red Spring, 47 percent; Durum, 14 percent; Hard Red Winter, 27 percent; Soft Red Winter, 23 percent; and White, 22 percent.

Experience in all agricultural-commodity standardization and marketing procedure has shown (1) that widely inclusive No. 1 grades in which there exists a wide range in utility values function to establish market prices by grade that follow closely the minimum quality represented by the grade requirements, and (2) that, under such conditions, the tendency constantly exists for the superior values in a widely inclusive No. 1 grade to be unrecognized in merchandising practice unless the commodity is merchandised by sample in a highly competitive market. Widely inclusive No. 1 grades do not function to bring premiums for products of relatively low quality included in a No. 1 grade merely because the commodity is designated No. 1, but they may, and often do, function to bring the producer of any commodity of relatively superior utility value within such grades a price that is less than it should bring according to its utility value.

The most useful and equitable grades for both the producers and consumers of agricultural commodities have been found by experience to be those which distribute the market receipts in a reasonably proportionate manner among several grades in accordance with the natural, normal variations in crop quality and in accordance with consumers' requirements. Such grades provide a practical trading volume of the commodity in each of several important grades and function to distribute market prices among producers and shippers more equitably than when grades attempt to include a high percentage of the market receipts in grade No. 1.

For these reasons and because of the widely inclusive character of grade No. 1 including No. 1 Hard, in the present official standards for hard red spring wheat, the Bureau recommends a readjustment of the grade factor test weight per bushel for wheat of the class Hard Red Spring, believing that such a readjustment would be useful and beneficial to all elements in the hard red spring wheat industry. In succeeding paragraphs, therefore, the Bureau submits for public consideration two plans for readjusting the test-weight-per-bushel factor for wheat of the class Hard Red Spring. One of these plans is designated as Plan A and the other as Plan B. Plan A proposes a revision of the test-weight requirements for grades 1, 2, 3, 4, and 5, from 58,

57, 55, 53, and 50 pounds, respectively, to 60, 58, 56, 54, and 51 pounds, respectively. Plan B proposes no change in the present test-weight requirements for the grades No. 1 to No. 5, inclusive, but proposes the adoption of a new grade No. 1 Heavy, applicable to all subclasses, based on a test-weight-per-bushel requirement of 60 pounds and on other grade requirements identical with those for grade No. 1. Under both of these plans the present official grade "No. 1 Hard" would be eliminated. Under the title Plan A there are included many statistical data with reference to the test-weight-per-bushel factor in Hard Red Spring wheat that are applicable also to the proposal made under Plan B.

In presenting these two plans for a readjustment of the test-weight-per-bushel factor for wheat of the class Hard Red Spring, the Bureau requests that producers, shippers, elevator operators, millers, inspectors, State and grain exchange inspection departments, and State agricultural colleges, give thoughtful consideration to each of the proposed plans, to the end that all elements in the hard red spring wheat industry may collaborate with the Bureau in selecting for ultimate adoption that plan which will best serve the industry.

Plan A—Proposed 60-Pound-Test-Weight Requirement for Grade No. 1, Hard Red Spring Wheat

Under Plan A the present official grade No. 1 Hard Spring, which is based on No. 1 grade requirements supplemented by special requirements of 60-pound test weight per bushel and 85 percent dark, hard, and vitreous kernels, would be eliminated; and in lieu thereof, the test-weight requirements of grade No. 1 for all subclasses of hard red spring wheat would be increased from 58 to 60 pounds.

Under this plan the important commercial grades No. 1 Dark Northern Spring and No. 1 Northern Spring would guarantee the buyer a minimum test weight per bushel of 60 pounds, and would include that small segment of the crop which now grades No. 1 Hard as well as a much larger segment of the crop which is equal to No. 1 Hard in all respects except kernel texture, which latter segment of relatively superior wheat is included, under the present official standards, with wheat of lower milling quality in No. 1 grades that guarantee a minimum test weight per bushel of only 58 pounds.

PRINCIPAL PURPOSE OF PROPOSED TEST-WEIGHT SPECIFICATIONS

The principal purpose of this proposed revision is to provide definite No. 1 grade designations, based on a 60-pound-test-weight-per-bushel requirement, for that important segment of the spring-wheat crop which is of No. 1 grade under the present official standards and which is also of relatively superior quality because of 60 pounds or more test weight per bushel but which contains less than 85 percent of dark, hard, and vitreous kernels and cannot, therefore, fully meet the requirements of the premium grade No. 1 Hard Spring.

Wheat of this character which has a test weight per bushel of 60 pounds or more is now included, under the present official standards, in the same grades with 58-pound wheat, where its superior quality for milling is not indicated by the grade designation. The inclusion of this segment of the spring-wheat crop in a No. 1 grade based on a 60-pound-test-weight requirement should serve to develop more

definite market quotations for such wheat, and to correlate market prices more closely with its utility value, especially at country points, than the present method for providing information about superior test weight in such wheat only by means of test-weight notations embodied under Remarks on certificates.

RELATION OF TEST WEIGHT AND DAMAGE FACTORS

Another important purpose in this proposed revision is that of providing a more equitable relationship between the grade factors test weight and total damage, in their effect on grade determination and market evaluation, than that which prevails under the present official standards for hard red spring wheat testing 58 pounds or more per bushel.

Under the present official standards for hard red spring wheat, all wheat weighing 60 pounds or more per bushel and otherwise meeting the requirements of the superior grade No. 1 Hard Spring and all wheat weighing 58 pounds or more per bushel and otherwise meeting the requirements of the important commercial grades No. 1 Dark Northern Spring, and No. 1 Northern Spring may contain not more than 2 percent of total damaged kernels. When wheat that meets all the grade requirements of any one of these superior grades of milling wheat except the requirement for total damage contains from 2.1 to 4 percent of damaged kernels (other than heat damage), it is de-graded to No. 2, which grade is now based on a test-weight requirement of only 57 pounds per bushel.

The relatively low test-weight requirement of 57 pounds for the present official grade No. 2 has an important influence on the basic contract prices for hard red spring wheat of the grades No. 2 Dark Northern and No. 2 Northern, which prices range from 3 to 4 cents per bushel under the contract prices for No. 1 wheat of the respective grades No. 1 Hard, No. 1 Dark Northern, and No. 1 Northern. Thus, in seasons when light sprout damage, for example, is common in hard red spring wheat, an important volume of superior milling wheat having high test weight per bushel and of No. 1 grade in all respects except that of sprout-damaged kernels (2.1 to 4 percent) is lowered by grade to the contract-price level of a No. 2 grade in which the test-weight requirement is but 57 pounds per bushel.

In contrast to this procedure under the present official standards for hard red spring wheat, the official standards for all other classes of wheat permit a maximum of 4 percent total damage for wheat testing 58 pounds or more per bushel. Thus, in these other classes of wheat, those lots of wheat which have superior test weight but which contain from 2.1 to 4 percent total damage are de-graded to the contract-price level for 58-pound wheat instead of to the contract-price level for 57-pound wheat, as is the case with hard red spring wheat.

In the important markets for wheat of the classes Hard Red Winter, Soft Red Winter, and Durum, wheat containing from 2.1 to 4 percent total damage but which weighs 58 pounds or more per bushel and which otherwise meets the requirements of grade No. 2 (contract grade), is deliverable on futures contracts at the basic price for contract wheat; whereas, in case of wheat of the class Hard Red Spring which contains from 2.1 to 4 percent total damage but which weighs 58 pounds or more per bushel and which otherwise meets the requirements for grade No. 1 (contract grade), delivery on futures

contracts may be made only at a discount of 2 to 3 cents per bushel under the basic price for contract wheat.

The proposal to revise the test-weight requirement for grade No. 1 in the standards for hard red spring wheat from 58 pounds to 60 pounds would include, also, a revision of the test-weight requirement for grade No. 2 from 57 pounds to 58 pounds. Thus, the proposed No. 2 grade based on a 58-pound test-weight requirement would allow a maximum of 4 percent total damage, and while the important commercial volume of 58- to 60-pound spring wheat which contains 2.1 to 4 percent damaged kernels (other than heat damage) would still grade No. 2, it would be included in a No. 2 grade based on a 58-pound test-weight requirement instead of a 57-pound requirement. The discounts for such No. 2 wheat should be less than for No. 2 wheat under the present official standards because of the higher test weight per bushel in the proposed No. 2 grade and because of the importance attached to test weight per bushel in market evaluation.

The importance of total damaged kernels in determining the grade of hard red spring wheat is exceeded only by test weight per bushel. According to data from the supervised receipts of hard red spring wheat in all United States markets for the 9-year period 1923–24 to 1931–32, inclusive, an average of 9.5 percent of such receipts contained more than 2 percent total damaged kernels, and there were 3 years, namely, 1926–27, 1928–29, and 1931–32, when the percentage of such receipts was greatly in excess of the average, being approximately 14, 23, and 18 percent, respectively.

These data show that in some years a material part of the crop of hard red spring wheat has its grade determined from the factor total damaged kernels. The evaluation, under contracts by grade, of all hard red spring wheat which has a test weight per bushel of 58 pounds or more and which is otherwise of No. 1 grade quality except for total damage (2.1 to 4 percent), is not accomplished as equitably under a No. 2 grade based on a 57-pound test-weight requirement as it should be under a No. 2 grade based on a 58-pound test-weight requirement.

This proposed revision in the major producing districts of the spring-wheat area is of particular importance to the producers of Ceres wheat which is more susceptible to sprout damage than Marquis wheat. The acreage of Marquis wheat is being replaced rapidly by Ceres wheat, because Ceres wheat usually yields more per acre and usually has a higher test weight per bushel than Marquis wheat.

TEST WEIGHT FACTOR OF NO. 1 HARD MORE IMPORTANT THAN KERNEL TEXTURE

The terminal-market premiums usually available for hard red spring wheat of the present official No. 1 Hard Spring are based nowadays to a greater extent on the test-weight-per-bushel requirement for this grade than on the kernel-texture requirement. In comparison with the premium contract grade No. 1 Dark Northern Spring (minimum test weight 58 pounds and minimum of dark hard kernels 75 percent), the grade of No. 1 Hard Spring guarantees the buyer 2 pounds per bushel more test weight and 10 percent more kernels of dark, hard, and vitreous character. Yet it is the additional 2 pounds of test-weight-per-bushel quality that is chiefly responsible

for the premiums usually offered for No. 1 Hard Spring wheat above the prices offered for No. 1 Dark Northern Spring wheat.

The reasons why test weight per bushel is of such relative significance in the determination of premiums for No. 1 Hard Spring wheat, are that test weight per bushel is an important and rather definite measure of the yield of flour in wheat, and that there is usually a material difference in flour yield between 60-pound wheat and 58-pound wheat, whereas the percentage of dark, hard, and vitreous kernels does not function as importantly as protein content in the terminal markets of the spring-wheat area in the evaluation of wheat according to its potential baking quality.

ADVANTAGES OF A 60-POUND TEST-WEIGHT REQUIREMENT FOR NO. 1 DARK NORTHERN AND NO 1 NORTHERN

For these reasons the elimination of the present official grade No. 1 Hard Spring, and the substitution therefor of No. 1 grades for all the subclasses of hard red spring wheat, based on a minimum requirement of 60 pounds test weight per bushel, should cause little, if any, difference in the evaluation of that relatively small segment (average about 5 percent) of the spring-wheat crop which is now included under the official standards in the grade No. 1 Hard Spring. On the other hand, the adoption of a 60-pound-test-weight requirement for the No. 1 grade that is applicable to all subclasses of hard red spring wheat, would provide grades that would include all wheat now included in No. 1 Hard Spring and that would include also a material segment (average about 13 percent but some years more than 20 percent) of wheat now included in the present official grades No. 1 Dark Northern Spring, No. 1 Northern Spring, and No. 1 Red Spring,[42] which has a test weight per bushel of 60 pounds or more, the superior value of which is not recognized and portrayed for contract-trading purposes by any of the grades of the present official standards.

When wheat of the present official grades No. 1 Dark Northern Spring and No. 1 Northern Spring, which has superior test-weight quality, is consigned to the terminal markets and sold on the sample floors its superior utility value is recognized and it commands premiums usually above the prices offered for wheat of the same grades that is of minimum-grade quality according to test weight per bushel. Under existing market practices, however, it is not a widespread practice in the spring-wheat area to publish quotations for wheat of the present grades No. 1 Dark Northern Spring and No. 1 Northern Spring, which has a test weight of 60 pounds or more per bushel. Often, therefore, in sales made by grade, especially at country points, the superior utility value of 60-pound-test-weight hard red spring wheat does not command the premiums to which such wheat is entitled, because market prices for wheat of the grades No. 1 Dark Northern Spring and No. 1 Northern Spring are based on the minimum test-weight-per-bushel requirement of 58 pounds for these grades. The grading of such wheat under the proposed grades No. 1 Dark Northern Spring and No. 1 Northern Spring, based on a minimum test-weight-per-bushel requirement of 60 pounds, would give definite recognition to its relatively superior utility value.

[42] The quantity of No. 1 Red Spring wheat received at all United States markets is so small (about 0.1 percent of the total receipts) as to be a negligible quantity for the purposes of this discussion.

The fact that one of the principal price-quoting agencies in the spring-wheat area has quoted premiums of 1 to 2 cents per bushel consistently in recent years for No. 1 Dark Northern and No. 1 Northern wheat weighing 60 pounds or more per bushel, indicates that there is a commercially important volume of such premium wheat and that well-established trade practices recognize the superior value of such wheat compared with No. 1 Dark Northern and No. 1 Northern wheat weighing but 58 pounds per bushel. Definite, regular, and widely published market quotations for such wheat would follow, as a matter of course, the proposed adoption of a 60-pound-test-weight specification for the important grades of spring wheat No. 1 Dark Northern and No. 1 Northern, which should function to bring out the premium values in wheat of this type for producers at all market points.

MUCH SPRING WHEAT GRADES NO. 1 AND HAS 60 POUNDS TEST WEIGHT

That segment of the hard red spring wheat crop which meets all the requirements of grade No. 1 of the present official standards, which also has a test weight per bushel of 60 pounds or more, but which has less than 85 percent of dark, hard, and vitreous kernels (No. 1 Hard Spring texture requirement), is sufficiently large to be of considerable commercial importance, especially in the comparatively new areas of production in the western part of the spring-wheat belt.

Data from supervised receipts of hard red spring wheat at Minneapolis and Duluth for the 7-year period 1924–25 to 1930–31 show that an average of approximately 18 percent of these receipts graded No. 1 on all factors and, in addition, had a test weight per bushel of 60 pounds or more, while an average of only about 5 percent of these receipts graded No. 1 Hard Spring. In other words, an average of approximately 13 percent of these wheat receipts met the requirements of grade No. 1, also tested 60 pounds in weight per bushel, but could not meet the requirements of 85 percent dark, hard, and vitreous kernels for the grade of No. 1 Hard Spring. During the 7-year period 1924–25 to 1930–31 there were two crop years, namely 1924–25 and 1928–29, when the percentage of receipts of No. 1 grade having 60-pound test weight were noticeably high. In the year 1924–25, approximately 5 percent of the receipts graded No. 1 Hard Spring, while about 28 percent graded No. 1, had a test weight of 60 pounds or over but could not meet the kernel texture requirements for No. 1 Hard Spring. Comparable percentages for the year 1928–29 were approximately 3 and 23 percent. While these percentages are computed from grain-supervision data at Minneapolis and Duluth which consist chiefly of appeal-inspection data, and which, therefore, may not be fully representative of the market receipts of hard red spring wheat, they are sufficinetly accurate to indicate the commercial importance of that segment of the spring-wheat crop that has 60 pounds test weight per bushel but less than 85 percent of dark, hard, and vitreous kernels.

In the comparatively new production areas of the western part of the spring-wheat belt, the percentage of the crop which grades No. 1 under the present official standards, which also has 60 pounds or more test weight per bushel, but which cannot meet the kernel texture requirements for the grade No. 1 Hard Spring, is undoubtedly higher than the percentages above given that are based on supervised receipts

at Minneapolis and Duluth. While no comparable data are available to illustrate this matter, it is logical and reasonable to deduce this conclusion from the well-known fact that a higher percentage of the hard red spring wheat produced in the western part of the spring-wheat belt tests 60 pounds or more per bushel than the wheat produced in the eastern part.

Data, for example, from supervised receipts of hard red spring wheat at Minneapolis and Duluth for the 7-year period 1924–25 to 1930–31, show that an annual average of approximately 28 percent of these wheat receipts of all grades had a test weight per bushel of 60 pounds or more. During this same 7-year period, test-weight data from the inspection of car-lot receipts of hard red spring wheat at all Montana inspection points show an annual average of approximately 48 percent of such receipts of all grades which had a test weight per bushel of 60 pounds or more, while for the years 1924–25, 1927–28, and 1928–29, the percentages were as high as approximately 76, 88, and 57, respectively. The Montana crops of 1922–23 and 1923–24 were also crops of very high quality with respect to test weight per bushel, the 1922–23 crop consisting of approximately 97 percent of wheat of all grades having a test weight per bushel of 60 pounds or more, and the crop of 1923–24 consisting of approximately 86 percent of such wheat.

COMPARISON OF TEST WEIGHTS IN HARD RED SPRING AND HARD RED WINTER WHEATS

There is a widespread belief that the average test weight per bushel of the hard red spring wheat crops is materially lower than that of the hard red winter wheat crops. This popular belief was reflected in the former adoption of the 58-pound-test-weight-per-bushel requirement for grade No. 1 of the standards for hard red spring wheat instead of the 60-pound requirement adopted for grade No. 1 of th standards for hard red winter wheat, and in the adoption by the grain trade of grade No. 1 for the chief contract grade for hard red spring wheat instead of grade No. 2 as is the case with hard red winter wheat. This popular opinion is not well founded, as may be seen from the data given in table 2 and from the data given in succeeding paragraphs with respect to the test weight of Montana wheat.

TABLE 2.—*Wheat: Percentage of yearly receipts of all grades at certain markets weighing 60 pounds or more per bushel, 1923–24 to 1932–33* [1]

Crop year	Duluth (Hard Red Spring)	Minneapolis (Hard Red Spring)	Kansas City (Hard Red Winter)	Omaha (Hard Red Winter)
	Percent	*Percent*	*Percent*	*Percent*
1923–24	10.29	12.67	4.69	4.67
1924–25	48.08	54.49	30.54	24.63
1925–26	18.33	19.37	16.81	23.44
1926–27	17.17	20.93	49.38	60.11
1927–28	17.38	22.32	17.33	25.19
1928–29	48.79	37.93	22.58	30.60
1929–30	40.26	15.15	9.70	25.85
1930–31	21.28	37.94	36.27	32.43
1931–32	3.46	2.36	46.84	36.59
1932–33 [2]	11.03	6.15	26.13	27.80
Average	23.61	22.93	26.03	29.13

[1] Data from Federal grain supervision records.
[2] July to December, inclusive, 1932.

From the data based on appeal inspections and Federal supervision of original inspections, given in table 2, it may be seen that for the 10-year period 1923–24 to 1932–33, the average percentage of the receipts of hard red spring wheat at Duluth and Minneapolis testing 60 pounds or more per bushel was only about 3 percent less than a similar average for hard red winter wheat at Kansas City and about 6 percent less than a similar average for hard red winter wheat at Omaha. For the 8-year period 1923–24 to 1930–31, the average percentage of such wheat receipts at Duluth and Minneapolis was approximately equal to the Omaha average and greater than the Kansas City average.

The 10-year average at Duluth and Minneapolis was reduced materially by the extremely low percentages of the receipts at these markets in 1931–32 which tested 60 pounds or more per bushel, caused by the abnormally low rainfall in the chief spring-wheat States—North Dakota, Montana, and South Dakota—during the calendar years 1930 and 1931. During the 51-year period, 1881 to 1932, the annual rainfall in South Dakota during 1931 was the smallest on record, in Montana the 1931 rainfall was the lowest on record during this period except for the year 1889, while in North Dakota there were only 5 other years during this period when the rainfall was as low or lower than that of 1931, among which were the 2 preceding years 1929 and 1930. It should be observed, also, from table 2, that there were crop years during the 10-year period 1923–24 to 1932–33 when the percentage of hard red winter wheat receipts at Kansas City, testing 60 pounds or more per bushel, were reduced materially below the 10-year average.

Because of the important position Montana now occupies among the spring-wheat producing States, the test-weight data on Montana wheat are of great significance in this study. Test-weight data, based on the original car-lot inspections of all inspected receipts of hard red spring wheat at Montana, inspection points for the 9-year period 1922–23 to 1930–31, show that for this 9-year period the average quantity of the wheat of all grades having test weights of 60 pounds or more was approximately 58 percent. There were no years during this period when the quantity of 60-pound wheat was less than 20 percent, and only 2 years (1925–26 and 1929–30) when it was less than 30 percent. On the other hand, there were 5 years during this 9-year period when the quantity of such wheat exceeded 50 percent of the receipts, and 4 years when it exceeded 75 percent.

Furthermore a comparison of the average quantity of 60-or-more-pound test weight hard red spring wheat in the comparatively new soil areas in Montana with the average quantity of such hard red winter wheat in the comparatively new soil areas in Texas, for the 8-year period 1923–24 to 1930–31, shows the average quantity of high-test-weight spring wheat in Montana to have been greater than that of Texas hard red winter wheat. According to data from original car-lot inspections of hard red spring wheat at all Montana inspection points for the 8-year period 1923–24 to 1930–31, the average quantity of wheat of all grades having a test weight per bushel of 60 pounds or more was approximately 53 percent, while similar data at Fort Worth, Tex., for the same period, show the average quantity of hard red winter wheat of all grades having a test weight of 60 pounds or more, to have been approximately 42

percent. There were 2 years during this period when the percentages of such hard red spring wheat were as low as 26 and 27 percent, respectively, whereas there were 3 years, in the case of the hard red winter wheat, when the percentages were as low as 24, 25, and 27 percent, respectively.

WESTWARD SHIFT OF SPRING-WHEAT ACREAGE

It is probable that this popular misconception about the test-weight factor in hard red spring wheat is caused by the fact that many people think of spring wheat too largely in terms of that part of the crop which is produced in the comparatively old soil areas of the eastern part of the spring wheat belt, whereas, the wheat crops often do not have the superior test-weight quality which they had in the pioneer days of wheat farming.

During the past 20 years, and especially during the past 15 years, the hard red spring wheat area has been decreased materially in Minnesota and in eastern North Dakota and South Dakota, and has increased materially in Montana and the western part of the two Dakotas.

In 1909, for example, 25 percent of the total hard red spring wheat acreage (total for Minnesota, North Dakota, South Dakota, and Montana) was in Minnesota, in 1917 it had decreased slightly to 24 percent, while in 1929 it was only 8 percent. The Montana acreage in 1909 was but 1 percent of the total acreage in these four States; in 1917 it had increased to 8 percent, while in 1929 it had expanded to 29 percent. Meanwhile, the North Dakota acreage of hard red spring wheat had decreased from 56 percent of the total acreage in 1909 to 49 percent thereof in 1929; and the South Dakota acreage decreased from 18 percent in 1909 to 14 percent in 1929.

While there were no such important changes in total acreage in North Dakota and South Dakota as those that took place in Minnesota and Montana, there were distinct shifts within the borders of these States, in that the oldest farming areas in the eastern part of these States took up diversified farming and substituted much barley, corn, and hay acreage for wheat acreage, while new wheat acreage was developed in western North Dakota and western South Dakota. In North Dakota in 1909, for example, approximately 78 percent of this State's total acreage of spring wheat (hard red spring and durum) was located approximately east of a north and south line drawn through Minot and Bismarck, while only approximately 22 percent of this acreage was west of this dividing line. In 1929, however, only approximately 56 percent of the North Dakota acreage was located east of this dividing line, while approximately 44 percent was located west of it. The decrease in North Dakota wheat acreage during this 20-year period was very marked in the eastern one third of the State, wherein the early settled Red River Valley area is located.

A similar east-to-west shift in spring-wheat acreage took place in South Dakota during the 20-year period 1909 to 1929. In 1909, 97 percent of the total acreage of spring wheat (hard red spring and durum) in South Dakota was located east of the Missouri River and but 3 percent of the acreage was west of it. In 1929, however, only approximately 76 percent of the South Dakota acreage was located east of the Missouri River, while approximately 24 percent was west

of it. The decrease in South Dakota wheat acreage during this 20-year period of time was very marked in that extreme eastern part of the State represented by the area that is approximately east of a north and south line drawn through Aberdeen and Mitchell.[43]

These data show that a material and important part of the present production of hard red spring wheat comes from comparatively new soil areas in Montana and in western North Dakota and South Dakota where soil and climatic conditions tend to favor the production of hard red spring wheat of relatively high quality with respect to test weight per bushel. Although these new areas of spring-wheat production suffer intermittent crop losses from insufficient rainfall, the crops that are produced tend to average higher in quality according to test weight per bushel, kernel texture, and protein content, than the crops in the comparatively older farming areas of the eastern part of the spring-wheat belt.

DESIGNATION BY GRADE OF SUPERIOR TEST WEIGHT DESIRABLE

In consideration of the facts above stated, which show that the test weight quality of hard red spring wheat is not inferior to that of hard red winter wheat, the present official standards for hard red spring wheat which use a 58-pound-test-weight specification for grade No. 1 (except in case of No. 1 Hard), do not grade such wheat, with respect to test weight, in conformity with utility values and market evaluations as well as do the standards for hard red winter wheat which use a 60-pound-test-weight specification for grade No. 1. Although the present official grade of No. 1 Hard Spring uses a 60-pound-test-weight specification, the additional requirement for this grade of 85 percent dark, hard, and vitreous kernels, is such a strict requirement that only a small part of the crops of hard red spring wheat grades No. 1 Hard Spring. There remains, therefore, under the present official standards, an important quantity of 60-pound-test-weight wheat which contains less than 85 percent of dark, hard, and vitreous kernels but which is of No. 1 grade, the utility and market values of which are not adequately differentiated by the present grades No. 1 Dark Northern Spring, No. 1 Northern Spring and No. 1 Red Spring.

The proposed revision of the test-weight requirement for grade No. 1 in the standards for hard red spring wheat from 58 pounds to 60 pounds would function to establish a logical and equitable standard for the market evaluation of this important segment of the spring-wheat crop, which has superior test-weight values but which cannot meet the strict kernel texture requirements of the present official grade No. 1 Hard, also, this standard should serve to emphasize and bring out market values for the many producers of wheat of this character in the major producing areas of North Dakota and Montana.

Although the effect of these proposed revisions of the test-weight requirements for grades No. 1 and No. 2 in the standards for hard red spring wheat would be to decrease the average total volume of No. 1 wheat and to increase the average total volume of No. 2 wheat in the spring-wheat markets, a concomitant effect would be to distribute the total market value of all wheat weighing 58 pounds or more per

[43] Data pertaining to spring-wheat acreage from the Division of Crop and Livestock Estimates, U. S. Bureau of Agricultural Economics.

bushel more equitably among producers than the distribution of market values now made under the present very wide and inclusive No. 1 grade.

CONTRACT GRADES UNDER THESE PROPOSED REVISIONS

Trade practices for hard red spring wheat, under the present official standards, have been built up around the 58-pound-test-weight specifications for grade No. 1 and around the use of No. 1 Northern Spring as the basic contract grade, in contrast with the trade practices for hard red winter wheat, soft red winter wheat, and durum wheat, that have been built up around the 60-pound-test-weight specification for grade No. 1, and around the use of the contract grades No. 2 Hard Winter, No. 2 Red Winter, and No. 2 Amber Durum, all of which require a test weight of 58 pounds but which have more liberal grade requirements for other grade factors than the contract grade No. 1 Northern Spring.

With the No. 1 grades for hard red spring wheat also based on a 60-pound-test-weight requirement, it would probably be necessary for the important spring-wheat markets to adopt the grade No. 2 Northern Spring as the basic contract grade for futures trading, in order to include in the contract grade a sufficiently large volume of wheat to operate broad and active future markets.

With respect to the usefulness of the proposed grade No. 2 Northern Spring as a contract grade, it should be observed that while this grade would guarantee the same limits for moisture, total damage, heat damage, total foreign material other than dockage, matter other than cereal grains, and total wheats of other classes, as those prescribed by the grade requirements of the present official grade No. 2 Northern Spring, the proposed grade No. 2 Northern Spring would guarantee the same test weight per bushel (58 pounds) as the present contract grade No. 1 Northern Spring. Furthermore, because of other proposed revisions of the grade requirements for hard red spring wheat, the proposed grade No. 2 Northern Spring would guarantee maximum limitations of 3 percent Durum and/or Red Durum and 0.3 percent Unnatural Material (corn, etc.) instead of the maximum limitations of 5 percent Durum and/or Red Durum and 2 percent Unnatural Material (as total foreign material) in the present official grade No. 2 Northern Spring. For these reasons the proposed grade No. 2 Northern Spring represents a better grade of wheat for futures contract purposes than the present official grade No. 2 Northern Spring.

There are no logical reasons why futures trading and other contract trading in hard red spring wheat cannot be conducted practically with the proposed grade No. 2 Northern Spring as the basic contract grade, with wheat of the No. 1 grades deliverable at premiums and wheat of the No. 3 grades deliverable at discounts, thus to bring trade practices for hard red spring wheat in line with the trade practices for the hard red winter, soft red winter, and durum wheats. The Bureau believes that this proposed change in the basic contract grade for futures-trading purposes, and the proposed increase in the test-weight requirement for grade No. 1, would exert a beneficial influence on the distribution of the total market value of the spring wheat crops among producers and shippers, and would serve constantly as a stimulus to the production of wheat of desirable variety and of high grade.

PLAN B—PROPOSED GRADE NO. 1 HEAVY FOR HARD RED SPRING WHEAT OF NO. 1 GRADE OF ANY SUBCLASS AND TESTING 60 POUNDS

Under Plan B no change would be made in the test-weight-per-bushel requirements for grades Nos. 1, 2, 3, 4, and 5, but the present official grade No. 1 Hard Spring would be eliminated and there would be substituted therefor a grade entitled No. 1 Heavy. The proposed grade No. 1 Heavy would be based on a grade requirement of 60 pounds test weight per bushel, in addition to the grade requirements prescribed for all hard red spring wheat of No. 1 grade, but would have no special requirements for kernel texture. It would be applicable to hard red spring wheat of any one of the subclasses Dark Northern Spring, Northern Spring, and Red Spring, which meets all the requirements for grade No. 1 and which also weighs 60 pounds or more per bushel. When applicable, it would be included in the complete grade designations, for example, as follows: No. 1 Heavy Dark Northern Spring, No. 1 Heavy Northern Spring, and No. 1 Heavy Red Spring. In all respects this proposed grade may be likened to No. 1 Hard Spring with the requirement for 85 percent of dark, hard, and vitreous kernels eliminated.

This proposed grade would accomplish by a different method the principal objective mentioned in the discussion of Plan A, namely, the establishment of a definite grade for that important segment of the crop of hard red spring wheat which is of No. 1 grade under the present official standards, which is also of relatively superior quality because of 60 pounds or more test weight per bushel, but which contains less than 85 percent of dark, hard, and vitreous kernels, and cannot, therefore, fully meet the requirements of the present premium grade No. 1 Hard Spring. The proposed grade No. 1 Heavy would include all wheat now graded No. 1 Hard as well as an additional and larger segment of 60-pound wheat now included, under the present official standards, in grade No. 1 of the subclasses Dark Northern, Northern, and Red Spring. If made a part of the standards for hard red spring wheat it would designate wheat of superior milling quality and would be rated commercially as a premium grade.

This plan for revising the test-weight specifications for wheat of the class Hard Red Spring would not necessitate any change in the basic contract grade for use in futures contracts or other contract transactions in the hard red spring wheat markets. The present grade of No. 1 Northern Spring would probably remain the basic contract grade, and the proposed grades No. 1 Heavy Dark Northern, No. 1 Dark Northern, and No. 1 Heavy Northern, would be grades designating superior quality above the level of quality designated by the basic contract grade No. 1 Northern. Also this plan would not disturb the existing proportions of the market receipts which fall into the numerical grades 1 to 5, inclusive.

On the other hand, this plan would necessitate the use of one more bin in the terminal elevators for the public storage of hard red spring wheat of the commercially important No. 1 grades than is required under the present official standards, and two more bins than would be required under the proposed Plan A. For example: Under the present official standards for hard red spring wheat there are three commercially important grades of No. 1 wheat tendered for public storage—No. 1 Hard, No. 1 Dark Northern, and No. 1 Northern; under proposed Plan A there would be only two commercially impor-

tant grades of No. 1 wheat—No. 1 Dark Northern and No. 1 Northern; while under Plan B there would be four commercially important grades of No. 1 wheat—No. 1 Heavy Dark Northern, No. 1 Dark Northern, No. 1 Heavy Northern, and No. 1 Northern.

Furthermore, Plan B does not provide as equitable a method as Plan A for the grading of hard red spring wheat weighing 58 pounds or more per bushel but which contains quantities of total damage ranging from 2.1 to 4 percent. (See discussion under Plan A.)

As a matter of fact, there are certain advantages associated with either Plan A or Plan B in comparison with the test-weight-factor requirements of the present official standards, and for this reason the Bureau is submitting both plans for public consideration in order to give all elements in the spring-wheat industry an opportunity to weigh the respective merits of both plans prior to the final adoption of either plan.

TEST-WEIGHT SPECIFICATIONS FOR OATS

A readjustment of the test-weight-per-bushel specifications for oats is recommended in the proposed standards. In case of the straight numerical grades it is proposed to retain 32 pounds per bushel as the minimum requirement for grade No. 1, but to increase the requirements for the other grades as follows: Grade No. 2 from 29 pounds to 30 pounds; grade No. 3, from 26 pounds to 27 pounds; and grade No. 4, from 23 pounds to 24 pounds. In addition to these revisions it is proposed to adopt two new special grades for oats of superior test weight, namely: Heavy Oats, requiring a minimum test weight per bushel of 35 pounds; and Extra Heavy Oats, requiring a minimum test weight per bushel of 38 pounds. These new special grades, when applicable, would be included in, and made a part of, any grade designation, as for example: No. 1 Heavy White Oats, No. 3 Heavy Red Oats, No. 1 Extra Heavy Red Oats, or No. 2 Extra Heavy White Oats.

Purposes of Proposed Revisions

The chief purposes of these proposed revisions are: (1) To cause the test-weight requirements of the numerical grades to conform more closely with the common ranges in the test weight of oat crops produced in the important oat areas east of the Rocky Mountains than the test-weight requirements of the present official standards, which requirements for grades 2, 3, and 4, are unnecessarily low, (2) to slightly improve the quality of oats required for grade No. 2, which grade is the basic contract grade in the oats markets of the Central, Eastern, and Southeastern States; thus to exert a tendency to strengthen the market prices for oats of 30 and 31 pounds test weight which are now often priced on the basis of the 29-pound-test-weight requirement for grade No. 2, (3) to bring the test-weight specification for grade No. 2 into conformity with the widely employed commercial specification of 30 pounds per bushel, (4) to provide official grades that would designate the test-weight values in the normally heavy test-weight oats of the Intermountain, Pacific Northwest, and Southwestern States, as well as in those segments of the oat crops produced in the North Central States which have superior test weight, and (5) to provide a definite grade basis for market quotations and market news service for oats of superior test weight.

Test Weights of Market Receipts of Oats

Very material segments of the market receipts of oats have test weights per bushel in excess of 32 pounds in numerous important markets. Data obtained from the supervised market receipts of oats for the 5-year period 1928-29 to 1931–32, inclusive, show that in the Pacific Northwest markets, an annual average of approximately 30 percent of the receipts tested 40 pounds or more per bushel, 96 percent tested 35 pounds or more, and 99 percent tested 32 pounds or more. In the Minneapolis and Duluth markets, an annual average of approximately 48 percent of the receipts tested 35 pounds or more per bushel, and 91 percent tested 32 pounds or more; at St. Louis, an annual average of approximately 14 percent of the receipts tested 35 pounds or more per bushel, and 58 percent tested 32 pounds or more; and at Chicago, approximately 17 percent of the receipts tested 35 pounds or more per bushel, and 70 percent tested 32 pounds or more. In the Omaha market for the 5-year period July 1, 1926 to June 30, 1931, approximately 15 percent of the total receipts of oats tested 35 pounds or more per bushel, and about 58 percent tested 32 pounds or more.

Relation of Test Weight and Utility Value of Oats

Test weight per bushel is a factor of outstanding importance in measuring the utility value of oats. Oats having high test weight are of relatively high utility value for either manufacturing or livestock feeding purposes, irrespective of the numerical grade assigned according to other grade factors. A lot of oats, for example, graded No. 3, under the present official standards because of 4 percent of wild oats but which has a test weight of 36 pounds per bushel, has a greater utility value for many buyers than another lot of oats which meets all the requirements of grade No. 1 but which has a minimum test weight per bushel of only 32 pounds.

Need for Designating Superior Test Weight in Oats

The test-weight specifications for the numerical grades of oats in the present official standards are too restricted in range from high to low to measure and express by grade the relative quality of oats in the numerous producing areas of the United States. As a matter of fact, a test-weight specification of 32 pounds per bushel for oats of grade No. 1 conforms to production conditions only in the so-called Corn Belt area and in the small areas of production in the Eastern and Southeastern States, and is too low for oats produced in the Intermountain, Pacific Northwest, Southwestern, and Upper Mississippi Valley States.

It is a practical impossibility to formulate a test-weight specification for oats of grade No. 1 that would conform to production conditions throughout the entire United States. It is considered impractical, also, to formulate separate subclasses for oats, based on the respective areas of production, and to use different test-weight specifications for each subclass, because of the extensive interstate commerce in oats, which would make it impossible, in many cases, for inspectors to determine the area of production in which the individual lot of oats had been produced.

Furthermore, it appears desirable to retain the test-weight specification of 32 pounds per bushel for oats of straight grade No. 1,

because of the large production of low test-weight oats in the so-called Corn Belt area, and because the most extensive storage of oats against futures contracts is done in this area, which procedure requires a contract grade comprising a material portion of each crop.

The retention of the test-weight specification of 32 pounds per bushel for oats of straight No. 1 grade makes it desirable to adopt some method for designating the premium quality of that material part of the oat crop which has superior test weight, which premium quality is not indicated by any of the grade designations of the present official standards.

Test Weight Notations Under Remarks

The need for definite information with respect to superior test-weight values in oats is partly met, under the existing methods of inspection procedure, by a regulation, that is not a part of the standards, which requires inspectors to note the exact test weight of each lot of oats on all certificates under Remarks, except for export grain. This form of information, which supplements the grade designation, now has a wide use in sample-floor trading and in special contracts for oats deliveries between grain dealers wherein any superior test weight desired by the purchaser is specified in addition to the grade designation, as for example, No. 2 White Oats 36 pounds.

Although such methods of specifying the relative quality of oats according to test weight per bushel may function satisfactorily to meet all special contract requirements of individual grain dealers and millers, it may be doubted whether they meet the requirements of the entire oats industry as well as they could be met by definitely established official grades indicative of superior test weight. Under the present system of designating superior test weight only by means of notations on certificates under Remarks, there are practically no market quotations made for oats of high test weight which are given publicity throughout the entire industry in market reports. The merchandising of oats under special contracts, and the scaling of prices according to test-weight variations within any given numerical grade, are market practices, therefore, that operate to a large extent after the oat crop has left the farm.

Proposed Special Grades for Heavy and Extra Heavy Oats

A practical method for designating the superior test-weight quality of oats by grade in standards wherein a minimum 32-pound test-weight-per-bushel specification is used for straight grade No. 1, is that of adopting special grades for Heavy Oats and Extra Heavy Oats for oats having superior test weight per bushel. These special grades as recommended in the proposed standards would apply to oats of the numerical grades below No. 1, as well as to grade No. 1, so that any lot of oats which has superior test weight would have such superior quality expressed in the complete grade designation. For example, a lot of oats which grades No. 3 on account of foreign material but which has a test weight per bushel of 36 pounds would be graded and designated under the proposed standards as No. 3 Heavy White Oats, whereas under the present official standards it grades as No. 3 White Oats. The proposed grade designation, No. 3 Heavy, would insure the delivery of a lot of oats having a test weight per bushel of

35 pounds or more, whereas the grade designation No. 3 under the present official standards does not insure a delivery having a test weight per bushel of more than 26 pounds.

Such special grades could be substituted in many cases for the supplementary test-weight specifications now often used in the special contracts for oats. Market quotations by grade for oats of superior test weight would be possible, and the dissemination of more information pertaining to market prices for such oats should be of benefit to producers, country shippers, and consumers. The existing method of noting the exact test weight on certificates under Remarks may well be retained, in order to provide information about the exact test weight per bushel for those who want more precise information than that given by the proposed grades alone.

Effect of Proposed Special Grades Heavy and Extra Heavy on Oats Warehousing

Although these two proposed special grades would increase the total number of official grades for oats, there is no reason to believe that any material change in oat-storage practices would result from these proposed revisions. The storage of oats in the United States is conducted very largely by warehouse operators and important grain dealers who own the grain at time of storage and handle it for their own accounts. The warehouseman, operating under the proposed oats grades would proceed to clean, condition, and mix oats of various quality, including the quality of test weight, to meet the requirements of such grades as the trade might select for contract purposes, or to meet the special requirements of millers and other oats users, just as oats are now handled under the present official standards to meet similar trade requirements.

Another Plan for Grading Heavy Oats Suggested to Bureau

In lieu of the special grades for Heavy Oats and Extra Heavy Oats, as outlined in the proposed oats standards, another plan for the grading of oats having superior test weight per bushel has been suggested to the Bureau. This plan is sufficiently meritorious to justify its presentation to the grain industry for consideration as an alternative to the proposed plan for the adoption of special grades for Heavy, and Extra Heavy, oats.

This suggestion is to adopt special grades for heavy oats that would be defined and that would function as follows:

Heavy oats.—Heavy oats shall be oats of any grade which weigh 33 pounds or more per bushel. Heavy oats shall be graded and designated according to the requirements of the standards applicable to such oats if they were not heavy, and there shall be added to, and made a part of, the grade designation, the test weight per bushel in terms of whole pounds.

In this suggested plan, all oats weighing less than 33 pounds per bushel would be graded and designated by the same methods that now prevail in the use of the present official standards, in which a minimum test weight per bushel is specified for each numerical grade. But in case of any oats weighing 33 pounds or more per bushel, the numerical grade would be determined according to the grade factors, other than test weight, which are applicable, and the test weight per bushel (in terms of whole pounds) would be included in, and made a part of, the

grade designation. For example, a lot of white oats grading No. 3 according to the grade factor "foreign material" but weighing 34 pounds per bushel, would be designated and certificated as No. 3 White Oats, 34 pounds. The same principle would apply to oats of any class and any grade.

The advantages of this plan for the grading of oats weighing 33 pounds or more per bushel, as advocated by its proponents, would be (1) it would not disturb or change the straight numerical grades commonly used as contract grades in the prevailing merchandising, storing, and futures-trading operations, in the important oat areas and markets east of the Rocky Mountains, (2) it would permit the selection and establishment of contract grades such as No. 2 Red Oats, 34 pounds, and No. 2 White Oats, 38 pounds, in those oat areas and markets in the Southwestern, Intermountain, and Pacific Coast States, where the present official standards specify test weights too low to conform to the local production conditions and merchandising requirements, (3) it would provide definite, official grades for use in the merchandising of oats between dealers, between country shippers and either dealers or millers under contracts specifying any degree of superior test weight desired, and (4) it would facilitate regular and definite market quotations by grade for oats of superior test weight.

This plan that has been suggested to the Bureau for the grading of oats weighing 33 pounds or more per bushel, is based, as a matter of fact, on the same general principles as the special grades for Heavy and Extra Heavy oats that are a part of the revised oats standards proposed by the Bureau. The chief difference is that this suggested plan would provide for a more detailed designation of superior test-weight values than the proposed special grades Heavy and Extra Heavy, in that it would designate test weight in 1-pound intervals by grade for any oats weighing 33 pounds or more per bushel, instead of designating test weight according to the wider intervals provided by the special grades Heavy (35 to 37.9 pounds) and Extra Heavy (38 pounds or more), which intervals would not designate the specific test weight of oats weighing 33, 34, 36, 37, 39, or more pounds. Another difference is that this plan would establish a larger number of grades than the proposed grades for Heavy and Extra Heavy oats.

Either this suggested plan for stating, in the grade designation, the test weight of oats weighing 33 pounds or more per bushel, or the proposed special grades Heavy and Extra Heavy, would accomplish the objective of providing definite special grades for oats of superior test weight. The eventual choice between these two plans may well be made with the advice and assistance of the grain industry.

GENERAL APPEARANCE FACTOR FOR OATS, FEED OATS, MIXED FEED OATS, BARLEY AND GRAIN SORGHUMS

The use of "general appearance" as a factor for the determination of numerical grade has been eliminated in the proposed standards for oats, Feed Oats, Mixed Feed Oats, barley, and grain sorghums. In lieu of the present numerical and sample grade specifications for general appearance it is proposed (1) that badly weathered Feed Oats, Mixed Feed Oats, or grain sorghums, should be included in Sample grade under definite specifications for "badly weathered" instead of under the interpretations of "distinctly low quality" now used for the grading of such grain; (2) that all oats which are stained but not

badly stained or weathered, all Feed Oats and Mixed Feed Oats that are stained or weathered but not badly weathered, all barley that is badly stained or weathered, and all grain sorghums that are stained or discolored but not badly weathered, should be included in special grades for Stained, applicable to each of these grains; (3) that all oats which are badly stained or weathered should be included in special grades for Weathered, applicable to oats; and (4) that all barley or grain sorghums which have good, natural color, should be included in special grades for Bright barley or Bright grain sorghums. The interpretation and practical application of these special grades and Sample grade specifications should be based on and controlled by standardized type samples prepared by the Bureau of Agricultural Economics.

By these methods the numerical grade of oats, Feed Oats, Mixed Feed Oats, barley, or grain sorghums would be determined without giving any consideration to the general appearance of the grain—whether good color, slightly stained, stained, badly stained, weathered, discolored, etc. Oats, for example, which are slightly stained or slightly weathered but otherwise of No. 1 grade quality, and which grade No. 2 or No. 3, as the case may be, under the present official standards only because of the slight stain or slight weathering, would grade as straight No. 1 Oats under the proposed standards. Also oats or grain sorghums which, under the present official standards, grade No. 3 because of stain or discoloration but which are otherwise of No. 1 grade, would grade No. 1 Oats, Stained, or No. 1 Grain Sorghums, Stained under the proposed standards. Barley or grain sorghums of any class and numerical grade which are of good, natural color, and free from any stain or discoloration, would have this premium quality emphasized and made a part of any grade designation by means of the special grades for Bright, as, No. 1 Bright Malting Barley, No. 3 Bright Barley, No. 1 Bright White Kafir, or No. 4 Bright Yellow Milo; whereas, under the present official standards for grain sorghums, this important commercial value is not recognized by any grade designation except No. 1, and in the present official standards for barley it is recognized only in case of one subclass in the class Western Barley.

Effect of De-grading Grain by General Appearance Factor

The principal purpose of these proposed revisions is to make the standards for oats, Feed Oats, Mixed Feed Oats, barley, and grain sorghums correlate as closely as possible with the utility values of these grains. In several respects it is doubtful whether the general appearance specifications of the present official standards for these grains correlate either with true utility values or market values. In case of oats, for example, slight stain, stain, and slight weathering, are exterior blemishes which affect the hull but do not affect the groats. Thus, to assign the grade of No. 2 to oats of high test weight, high sound kernel content, and low moisture content, merely because they are slightly stained, or the grade of No. 3 because they are stained or slightly weathered, labels such oats with designations indicating relatively low quality, which are not in accordance with the utility values.

Such a large part of the market oats is stained and weathered that the grading factor "general appearance" specified in the present

official standards for oats causes a high percentage of oats to fall into grades No. 3 and No. 4 and a relatively small percentage to fall into grades No. 1 and No. 2. According to data from the supervised receipts of white oats at all important oats markets in the United States for the 9-year period 1923–24 to 1931–32, an average of 60 percent of such oats receipts graded lower than No. 1 and 38 percent graded No. 3, on account of the factor general appearance. According to data compiled for investigational purposes from 3,723 samples of white oats of the 1931–32 and 1932–33 crops, obtained from all important oats markets, approximately 81 percent of all samples graded lower than No. 1 and 53 percent graded No. 3, under the present official standards, on account of the factor general appearance.

The inclusion of a large segment of the oats crop in grade No. 3 because of the factor general appearance, has made grade No. 3 the most widely used grade of oats for commercial purposes east of the Rocky Mountains, even though grade No. 2 is specified by many of the important grain exchanges as the contract grade for futures trading. The No. 3 grade of the present official standards, in which general appearance is the principal factor in the determination of grade, comprises a very material volume of oats that is of No. 1 and No. 2 grade according to the factors of test weight per bushel, sound cultivated oats, etc., the utility value of which is distinctly superior to that represented by the minimum requirements on all factors for grade No. 3. The superior value in such oats is not indicated and the price paid for them often is not in accordance with utility value when they are included in a No. 3 grade which covers such an extremely wide range of quality.

With general appearance eliminated as a factor for determining the numerical grade of oats, as recommended in the proposed standards, the volume of the market receipts that would fall into grades 1, 2, and 3 combined, would be practically the same as under the present official standards, but a greater volume would be included in grades No. 1 and No. 2, thus providing a practical volume of oats for trading purposes in each of the first three grades. This distribution would cause the approximate, relative utility value of oats to be designated by grade better than such values are designated by the present official grades.

Proposed Special Grades for Stained Oats, Barley, and Grain Sorghums

Although stain is not of sufficient importance as a measure of utility value to justify its use as a specification for the determination of numerical grade, it is recognized that a certain market or buyers' prejudice exists against this form of blemish. Thus, the special grade Stained, as recommended in the proposed standards for oats, Feed Oats, Mixed Feed Oats, barley, and grain sorghums, would designate the stained quality of the grain regardless of its numerical grade. Such proposed grade designations as No. 1 White Oats, Stained and No. 2 White Oats, Stained express clearly the fact that the numerical grade of the lot of oats is No. 1 or No. 2 according to test weight, sound kernels, etc., but that the oats are stained. These proposed grade designations portray the relative utility values of stained oats much better than the unqualified grade designation of No. 3 which is the grade designation for such oats under the present official standards. These examples of grade designations and utility values in oats are

illustrative of similar principles in the proposed standards for barley and grain sorghums.

Proposed Special Grade for Weathered Oats

The proposed special grade for Weathered oats would include oats that are badly stained or weathered. This grade would be applied to oats very rarely in inspection practice because only a small segment of the oat crops is injured sufficiently by the elements to become stained or weathered in the material degree required by this grade. Under the proposed numerical and special grades for oats the great majority of the commercial lots of oats would come within the general appearance limitations of the unqualified numerical grades (good color, slightly stained, or slightly weathered), or within the limitations of the special grade for Stained oats (stained but not badly stained or weathered). Although little use would be made of the proposed special grade for Weathered oats, its adoption as a part of the revised standards for oats is desirable in order to provide a definite minimum limitation on the general appearance quality of oats covered by the special grade Stained oats. Its chief function, therefore, in the proposed standards, is to guarantee the buyer of oats of such grades as No. 1 White Oats, Stained or No. 2 White Oats, Stained that such oats may not consist of oats so severely injured by the elements as to be badly stained or weathered.

Proposed Special Grades for Bright Barley and Grain Sorghums

The market preference for brightness (good, natural color) is pronounced in case of barley and grain sorghums of any class and numerical grade. In case of barley it is a quality desired by maltsters and brewers. Brightness is now a requirement for the subclass Bright Western in the official standards although not specified in any manner in the standards for barley grown east of the Rocky Mountains. In case of grain sorghums the quality of brightness is a factor of special importance in the merchandising of grain sorghums in the poultry feed trade, especially on the Pacific coast. Many special contracts are made in the grain trade for No. 2 White Kafir and No. 2 Yellow Milo, which include the supplementary specifications "shall be of good color" because, in the present official standards for grain sorghums, good color (brightness) is guaranteed by grade designations only in case of grade No. 1.

The proposed standards for barley and grain sorghums recognize fully the market preferences for good, natural color in these grains, and provide the definite special grade Bright for emphasizing and designating this premium quality when present in these grains of any class and numerical grade.

Special Grades Stained and Bright Would Simplify Inspection Procedure

Inspection procedure for oats would be simplified, and the accuracy of application of general appearance specifications should be improved by these proposed revisions. In the application of the general appearance specifications of the present official standards for oats, the inspector is required to differentiate between good color (grade No. 1)

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and slightly stained (grade No. 2); between slightly stained (grade No. 2) and either stained or slightly weathered (grade No. 3); and between either stained or slightly weathered (grade No. 3) and either badly stained or weathered (grade No. 4); whereas in the application of general appearance specifications in the proposed standards the inspector would be required to differentiate only between oats that are stained (special grade Stained) and oats that have a general appearance superior to pronounced stain (unqualified numerical grades), and between oats that are stained (special grade Stained) and oats that are badly stained or weathered (special grade Weathered). Thus the proposed standards for oats would reduce the dividing lines between grades, according to general appearance, from 3 such lines to 2. As a matter of practical inspection procedure, and for the great majority of cases, there would be but one such dividing line between grades in the proposed standards for oats, namely, that between oats which have a general appearance superior to pronounced stain (unqualified numerical grades) and oats which are stained (special grade Stained). The inspector would be required only rarely to differentiate between oats which are stained (special grade Stained) and oats which are badly stained or weathered (special grade Weathered).

While the examples and explanations of the factor of general appearance herein given have been for oats, they are equally applicable in principle, if not in detail, to the grading of barley, grain sorghums, Feed Oats, and Mixed Feed Oats, under the specifications of the official standards and the proposed standards.

GARLICKY GRAIN

The present official grain standards provide special grades for garlicky wheat, garlicky rye, and garlicky barley. For each of these grains the special grade Garlicky is made a part of the complete grade designation when the grain has an unmistakable odor of garlic or when it contains garlic bulblets in a quantity equal to one or more bulblets in 1,000 grams of grain. In inspection procedure, under the present official standards, garlic determinations for wheat and rye are made on the basis of the grain including dockage, and for eastern barley on the basis of the grain including foreign material. The minimum requirement of "one bulblet in 1,000 grams of grain" is interpreted either as one fresh or newly harvested bulblet or as three dry bulblets. Also, in existing inspection procedure, as it relates to the certification of garlicky wheat, inspectors are required by regulation to embody under Remarks on all certificates, except those issued for export shipments, a statement of the approximate quantity of garlic bulblets in terms of Light Garlicky, Medium Garlicky, and Heavy Garlicky. The term, Light Garlicky, is defined to mean a quantity of garlic bulblets equal to 1 to 3 bulblets, inclusive, Medium Garlicky as 4 to 15 bulblets, inclusive, and Heavy Garlicky as more than 15 bulblets, respectively, in 1,000 grams of wheat.

Proposed Special Grades for Garlicky Grain

In the proposed standards the recommendation is made to adopt special grades for garlicky oats and garlicky Mixed Grain as well as to continue the use of special grades for garlicky wheat, garlicky rye,

and garlicky barley. Also the recommendation is made in the proposed standards to slightly liberalize the minimum requirements for the special grades Garlicky wheat and Garlicky rye by comparison with the present official standards, and to make the minimum requirements for the grades Garlicky oats and Garlicky barley much more liberal than those for wheat and rye. Thus, in the proposed wheat and rye standards, these grains would be considered garlicky when they have an unmistakable odor of garlic or when they contain garlic bulblets "in excess of a quantity equal to 1 newly harvested bulblet of average size in 1,000 grams of grain." Oats and barley, under the proposed standards, would be considered garlicky when they contain garlic bulblets "in excess of a quantity equal to three newly harvested bulblets of average size in 500 grams of grain." The determination of these quantities of garlic would be made for each kind of grain on the basis of the original sample inclusive of dockage and foreign material, just as such determinations are now made under the official standards, and official interpretations would be made of the quantity of dry bulblets that would be equivalent by weight to a given number of newly harvested bulblets of average size.

In the proposed standards for wheat and rye the recommendation is made, also, to adopt for each of these grains three special grades for garlicky grain in lieu of the one special grade Garlicky now in effect. These grades would be entitled Light Garlicky, Medium Garlicky, and Garlicky. The grade Light Garlicky wheat, for example, would comprise wheat having the unmistakable odor of garlic or wheat which contains garlic bulblets in excess of a quantity equal to one but not in excess of a quantity equal to five newly harvested bulblets of average size in 1,000 grams of wheat. The grade Medium Garlicky wheat would comprise wheat which contains garlic bulblets in excess of a quantity equal to 5 but not in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of wheat. The grade Garlicky wheat would comprise wheat which contains garlic bulblets in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of wheat. Any one of these special grades, when applicable, would be made a part of the complete grade designation, as for example: No. 2 Red Winter, Light Garlicky, or No. 2 Red Winter, Garlicky. With these special grades in the standards for wheat and rye there would be no necessity for the regulation requiring inspectors to note under Remarks any statements about the quantity of garlic.

Garlicky Oats, Barley, and Mixed Grain

No definite specifications for the grading of oats containing garlic bulbs are provided in the present official standards. According to present inspection procedure, oats that are distinctly garlicky are usually graded Sample grade under the interpretative Sample grade specification of "distinctly low quality." Except in the unusual cases of very badly infested oats, this procedure, when followed, applies an unduly severe penalty to garlicky oats; while in other cases, oats that are garlicky but not badly infested may be graded under the unqualified numerical grades, thus passing into commerce in the same category with garlic-free oats.

While the volume of garlicky oats is small as compared with that of garlicky soft red winter wheat, the occasional lots of oats which do contain any material quantity of garlic are objectionable to grain handlers, oat millers, and feed manufacturers, and should not be deliverable on contracts based on straight grades. The proposed grade for Garlicky oats would rectify this matter. Also the adoption of standards for Mixed Grain would necessitate the adoption of special grades for garlicky Mixed Grain if these standards are to be comparable with the standards for wheat, rye, oats, and barley, as regards garlicky grain and garlic-free grain.

The proposed tolerance in the straight grades of oats and barley of 3 garlic bulblets in 500 grams of grain, which is 6 times greater than the tolerance for garlic in the straight grades of wheat and rye, is justified by reason of the fact that the chief use of oats and barley is for stock feed in which a small quantity of garlic does not seriously affect the utility value, whereas the chief use of wheat and rye is for human food products, in the manufacture of which small quantities of inseparable garlic bulblets in the grain may increase the cost and lower the efficiency of milling operations as well as to taint the products.

The volumes of market oats and market barley which contain garlic are relatively small. The proposed grades for garlicky oats and garlicky barley would apply to market oats and barley only at rare intervals. For those occasional lots, however, which contain material quantities of garlic bulblets, these special grades would serve to differentiate such garlicky grain from the relatively superior garlic-free grain.

Relative Utility Values Portrayed by Proposed Garlicky Grades

For the purposes of merchandising garlicky wheat and rye by grade and of establishing definite market quotations and market news service for such grain by grade, it is desirable that the relative degree or quantity of garlic in wheat and rye should be designated by grade rather than by notation of such information on certificates under Remarks.

In the present official standards for wheat, the special grade Garlicky is included in and made a part of the grade designation for any wheat which has either the unmistakable odor of garlic or which contains garlic bulblets in any quantity ranging from a quantity equal to 1 bulblet to 200 or more bulblets in 1,000 grams of wheat. The relative utility or mill values within such a very wide range of quality according to the garlic factor are not expressed by the present official grade Garlicky. That grade merely serves as a derogatory label for all wheat which by reason of either a small or a large garlic content cannot meet the unqualified requirements of the straight numerical grades for wheat.

In the total market receipts of soft red winter wheat the volume of wheat containing garlic is much grater than the volume of garlic-free wheat. The different utility values in this comparatively large volume of garlicky soft red winter wheat are appraised and brought out usually wherever such wheat is merchandized under the competitive conditions of sample-floor trading. Soft red winter wheat, however, is not merchandised by sample-floor methods to the same extent as hard red winter and hard red spring wheat. Much of

the milling of soft red winter wheat is done by relatively small interior-point mills which obtain a part of their wheat supply from contiguous areas of production without official grading, and another part is purchased from terminals or distant country shipping points by grade. Also, under existing market practices at the important markets for soft red winter wheat, the terminal elevator purchases are made by grade to a greater extent than by sample floor trading. In these numerous transactions by grade the relative utility values in garlicky wheat are not expressed by the present widely comprehensive official grade Garlicky, and under such conditions there is a tendency to apply broad, average discounts to garlicky wheat. Neither the miller nor the producer is assured of even an approximate "value-received" transaction under such grading and marketing practices.

For these reasons it is a matter of importance that the approximate utility values in soft red winter wheat according to the factor of garlic should be designated by grade and portrayed in the complete grade designation on certificates of inspection. The specifications for the three special grades Light Garlicky, Medium Garlicky, and Garlicky wheat, recommended in the proposed wheat standards, would accomplish this purpose in large degree. They would function (1) to slightly increase the trading volume of straight grade soft red winter wheat which could be milled with no risk whatever of producing garlicky tainted flour and with very little or no risk of causing garlic-gummed rolls during the grinding process; (2) to provide a commercially practical trading volume of Light Garlicky soft red winter wheat which could be milled in the vast majority of cases with no risk of producing garlicky tainted flour and with the maximum risk of garlic-gummed rolls reduced to a small number of mill shut-downs per 24 hours for roll-cleaning purposes; (3) to provide a commercially practical trading volume of Medium Garlicky soft red winter wheat which would be relatively more acceptable to elevators and mills, equipped to store and dry wheat and to remove the garlic bulblets therefrom by screening and aspiration, than wheat containing large quantities of garlic bulblets, even though such wheat would contain sufficient garlic in some cases to constitute an immediate milling hazard from either tainted flour or mill shut-downs to clean the rolls; (4) to segregate under the proposed grade Garlicky soft red winter wheat, all wheat containing a quantity of garlic bulblets which, if newly harvested and inseparable prior to immediate mill grinding, would be sufficient to cause numerous mill shut-downs to clean the garlic-gummed rolls and in numerous cases to taint the flour; and (5) to provide a definite basis for market quotations and market news service on these relative utility values in garlicky wheat.

If garlicky wheat were graded and designated by methods that would correlate utility values approximately with the grade designations, as recommended in the proposed standards, it should be possible for the markets to establish price differentials for garlicky wheat according to the relative utility values and according to the costs for cleaning and conditioning such wheat, thus providing a more systematic and equitable system for the determination of price differentials than that which prevails under the present official standards.

The most important data and evidence from which these conclusions were made are given in succeeding paragraphs.

Proposed Definition of Garlicky Wheat

There are several important facts about the grading and handling of garlicky wheat prior to its milling that must be kept in mind in connection with the proposed and slightly liberalized definition for garlicky wheat in the proposed wheat standards. One of these is that the specifications for garlicky wheat apply to original samples of grain inclusive of dockage and foreign material, and do not, therefore, portray the quantity of garlic in the wheat after the removal of dockage. Another of these facts is that a material part of the soft red winter wheat crop is usually stored in large elevators for at least several months prior to its utilization by the mills, and that during this period of time the garlic bulbs lose moisture more rapidly than the wheat, shrink materially in size, and may be separated much more easily from the wheat than newly harvested bulbs.

The screening of garlicky wheat prior to milling by elevators, or by mills, or by both, removes anywhere from approximately 10 to 100 percent of the garlic bulblets, depending on the size of the bulblets and on whether the bulblets are newly harvested or shrunken and dry. Data pertaining to the separation of newly harvested garlic bulblets from wheat, obtained by the Pennsylvania State College from 5 mills during a 5-day test for each mill in 1923, are indicative in this matter.[44] In this study the average number of newly harvested bulblets in 1,000 grams of uncleaned wheat as received by the mills was 19.4, while after screening the average number in the wheat at the first break rolls was 4.9; in other words, the screening removed 75 percent of the newly harvested bulblets. The percentages of garlic bulblets removed by screening by the individual mills were as follows: 71, 80, 75, 73, and 71. In case of old wheat that has been in storage, or artificially dried new wheat, the Pennsylvania studies report the garlic problem for the miller as being practically nil because all or practically all of the shrunken dried bulblets may be removed by screening.

For these reasons the grades assigned to country-run garlicky wheat under the proposed standards would not necessarily, in the usual commercial practice, represent the garlicky quality of the wheat at the time it goes to the mill rolls. In many cases country-run wheat graded Medium Garlicky, under the proposed standards, would be screened to become Light Garlicky in character, or wheat graded Light Garlicky would be screened to meet the requirements of the straight numerical grades, or wheat graded in a straight numerical grade which contained the proposed small tolerance of garlic bulblets (one bulb in 1,000 grams of wheat) would have all or practically all the garlic bulblets removed by screening.

These facts with reference to the grading and handling of garlicky wheat justify the slight liberalization of the definition for garlicky wheat recommended in the proposed standards. Under the present official standards the presence of one stray garlic bulblet in a 1,000-gram sample of wheat is sufficient to cause the wheat to be graded Garlicky, whereas under the proposed standards the quantity of garlic bulblets necessary to cause the assignment of the proposed special grade Light Garlicky would have to be a quantity "in excess of a

[44] Stuart, G. A. Problems in marketing Pennsylvania wheat. Penn. Dept. Agr. Gen. Bul. 393 (v. 7, no. 14), 38 p., illus. 1924; also unpublished data of the Pennsylvania State College by courtesy of B. W. Dedrick, assistant professor of milling engineering.

quantity equal to one but not in excess of a quantity equal to five newly harvested bulblets of average size in 1,000 grams of wheat." While this slight liberalization in the definition for garlicky wheat would probably increase slightly the volume of straight grade soft red winter wheat, it would not allow sufficient garlic in such grades of wheat to have any effect whatever on flour quality or any appreciable effect on mill operations with well-cleaned wheat. On the other hand, it would prevent the grading as Garlicky (as under present official standards) of many lots of good milling quality soft red winter wheat which contain only one bulblet of garlic in 1,000 grams of uncleaned wheat.

Practical Division of Garlicky Wheat by Proposed Grades Light Garlicky, Medium Garlicky, and Garlicky

The proposed definition for garlicky wheat (also rye) and the proposed specifications for the special grades Light Garlicky, Medium Garlicky, and Garlicky, in the proposed standards, would establish three dividing lines in garlicky wheat according to (1) the known effect of certain quantities of garlic bulblets on the gumming of the mill break rolls, and (2) the known effect of certain quantities of garlic bulblets on the odor or flavor of flour and bread manufactured from garlicky wheat.

The studies of milling operations with garlicky soft red winter wheat at five Pennsylvania mills made in 1923 by the Pennsylvania State College,[45] show that a very definite gumming of the mill break rolls takes place in the grinding of wheat containing five to eight newly harvested garlic bulblets per 1,000 grams of wheat at the first break rolls, which causes a loss in flour yield as well as the losses incident to shutting down the mill every 3 or 4 hours to clean the rolls. With wheat at the first break rolls containing one to two bulblets per 1,000 grams of wheat, the necessity for shutting down the mill to clean the rolls so as to prevent loss of flour in the offal was reduced to two or three shut-downs in every 24 hours of mill operation.

Concurrently with the studies of mill operation above mentioned, bread-baking studies with flour made from garlicky wheat were conducted by the Pennsylvania State College in cooperation with the United States Bureau of Agricultural Economics. The conclusions made from these studies by B. W. Dedrick, assistant professor of milling engineering of the Pennsylvania State College, were as follows:

> Garlic does not affect the flour to any appreciable extent unless when it is excessively ladened, say about 10 bulblets per 1,000 grams of wheat (meaning at the first break rolls). In the course of a few days it loses the odor and after baking no perceptible odor or flavor can be distinguished.

On the basis of these data, as well as on the basis of the observation and experience of others who have had experience in the handling and milling of garlicky wheat, the proposed standards for garlicky wheat have been so formulated as to differentiate garlicky wheat according to the effects of certain quantities of garlic bulblets on milling operations and on flour quality.

[45] Stuart, G. A. Op. cit., also unpublished data of the Pennsylvania State College by courtesy of B. W. Dedrick, assistant professor of milling engineering.

The first proposed differentiation is that between straight grade wheat and wheat of the grade Light Garlicky, which would be represented by the grade requirements for Light Garlicky, namely:

> An unmistakable odor of garlic, or garlic bulblets in excess of a quantity equal to one but not in excess of a quantity equal to five newly harvested bulblets of average size in 1,000 grams of wheat.

According to these specifications, wheat of any straight numerical grade could not carry the unmistakable odor of garlic or contain garlic bulblets in a quantity that would be in excess of a quantity equal to one newly harvested bulb per 1,000 grams of wheat. Thus wheat of the straight grades would guarantee no possibility of a tainted flour product and only a very slight risk in mill operation from gummed rolls. On the light-garlicky side of this dividing line the proposed grade Light Garlicky would guarantee wheat from which the flour products would be free of garlic taint in practically all cases, but which might necessitate a few mill shut-downs every 24 hours to clean the rolls in case of inseparable garlic bulbs. Under this proposed grade of Light Garlicky there would be, therefore, a comparatively large commercial volume of fair to good quality wheat, according to the garlic factor, which would be directly usable by many mills, especially those that have good wheat-cleaning equipment.

The second proposed differentiation is that between wheat of the grades Light Garlicky and Medium Garlicky, which would be represented by the maximum quantity of garlic bulblets permitted in the grade Light Garlicky, namely: "A quantity not in excess of a quantity equal to five newly harvested bulblets of average size in 1,000 grams of wheat." On the medium-garlicky side of this dividing line the proposed grade Medium Garlicky would include garlicky wheat known to contain a sufficient quantity of garlic bulblets (more than 5 but not more than 15 in 1,000 grams of wheat) to cause numerous mill shut-downs daily to clean the break rolls, as well as to include some wheat so strongly garlicky (10 to 15 bulblets in 1,000 grams of wheat) as to create a hazard from tainted flour, unless the bulblets are easily separable and removed from the wheat prior to its grinding. Some of the wheat which, at the time of inspection, would grade Medium Garlicky under the proposed standards (more than 5 but not more than 15 bulblets in 1,000 grams of wheat) would be directly usable for milling. All wheat of this grade would have more value to those mills and elevators that are equipped to dry, store, mix, and clean the grain to remove garlic bulblets, than wheat containing a large quantity of garlic bulblets, because of the relatively lower expense for preparing it for mill usage.

The third proposed differentiation is that between wheat of the grades Medium Garlicky and Garlicky, which would be represented by the maximum quantity of garlic bulblets permitted in the grade Medium Garlicky, namely: "A quantity not in excess of a quantity equal to 15 newly harvested bulblets of average size in 1,000 grams of wheat." On the garlicky side of this dividing line the proposed grade Garlicky would include all garlicky wheat so heavily infested with garlic bulblets as to cause many mill shut-downs daily to clean the break rolls and as to constitute a definite threat of tainted flour in practically all cases where the bulbs are not readily separable. In the majority of cases country-run wheat that would be graded Garlicky under the proposed standards is not ready for direct mill

grinding but should be artificially dried or stored to await natural drying, and finally cleaned when the bulbs are dry, in preparation for mill usage.

In considering the application of these proposed specifications to country-run garlicky wheat, it should be repeated and kept in mind that these specifications would be applied to wheat samples prior to the removal of dockage and foreign material. Thus, in the majority of cases, the actual quantities of garlic in cleaned wheat would be materially less than the quantities tolerated by the special grade specifications for Light Garlicky, Medium Garlicky, and Garlicky.

REMARKS ON CERTIFICATES [46]

The diverse interests of buyer and seller always have caused and probably always will cause differences of opinion within the grain industry as to the usefulness of remarks on inspection certificates which give analytical information that is supplementary to the grade designation. As a general rule the buyer wants to obtain all information possible about the quality of grain offered for sale. Sellers, on the other hand, may or may not favor the noting of detailed information on certificates, depending often on whether they believe such information will enhance the sale value of the grain or cause discounts. Ever since the Grain Standards Act has been in effect, therefore, the Bureau has been petitioned, from time to time, to eliminate entirely, or to restrict, or to increase, the noting of analytical information on certificates under Remarks. Occasionally, the idea is even advanced that such information should be noted on certificates covering market receipts but eliminated entirely on certificates covering market shipments.

Remarks Required by Present Regulations

From among these diverse opinions, a policy was developed ultimately, in connection with the enforcement of the Grain Standards Act, which requires all inspectors, by regulation, to note under remarks on all certificates, except those issued for export shipments, a statement of (1) the factor or factors which determined the grade, except in the case of Grade No. 1, (2) the test weight per bushel of wheat, rye, barley, oats, Feed Oats, and Mixed Feed Oats, and (3) the approximate quantity of garlic bulblets when present in wheat in terms of "light garlicky", "medium garlicky", or "heavy garlicky". These mandatory remarks are not noted on certificates issued for export shipments because such shipments consist almost entirely of grain of a few important contract grades (usually grades No. 1 and No. 2) with which foreign buyers have become familiar, and because export commerce and contracts have been built up around these unqualified numerical grades.

Present Policy with Reference to Optional Remarks

In addition to these Remarks which the regulations require all inspectors to note on certificates, the policy of the Bureau has been to authorize any grain inspection department operating under the Grain Standards Act, either as a regular practice or upon petition in connection with individual lots of grain, to note under Remarks on

[46] Remarks on certificates are not specified in the grain standards but are governed by regulations issued by the U.S. Department of Agriculture pertaining to the notation of information on grain-inspection certificates.

its certificate of inspection any other facts about the quality of grain as determined from analyses incidental to grade determination. Thus, in some markets the practice has developed of regularly noting under Remarks, in addition to the three items required by regulation, such notations as "percent moisture"; degree of smut in wheat, whether "light", "medium", or "heavy"; percentages of wheat of different subclasses in Mixed Wheat; or percentages of wheat of different varieties in a given subclass. Also, in case of individual lots of grain, many certificates are issued which, by application on the part of interested parties, contain notations under Remarks pertaining to the percentage of damaged kernels, the kind and percentage of other grains, or other analytical data.

Detailed Information Needed in Grain Trading

These practices of certifying certain kinds of analytical information under Remarks on inspection certificates, indicate the tendency in our grain commerce to evaluate grain according to numerous individual factors of quality as well as according to grade alone; also, the tendency to rely on the inspection departments for the analyses that reveal values within the grades. So long as the present form and structure of the official grain standards are maintained, whereunder the numerical grade may be determined from a single grade factor which represents a quality lower than that represented by any other grade factor, the Bureau believes that this tendency in the grain industry to require analytical information about the individual factors of quality will persist and even increase because the requirements of domestic grain consumers tend toward discriminating and particularized methods for determining the utility values of grain for manufacturing or direct consumption, or for the purpose of cleaning, conditioning, and blending individual lots of grain to improve their grade.

For these reasons, it appears desirable to adopt a more definite policy than that now in effect with reference to this feature of grain inspection and certification. This policy should be that of selecting a few kinds of analytical information which are now required and used most widely in trade practice and which are known to have an established effect on market premiums and discounts, and to either incorporate such information in grade designations or to require inspectors, by regulation, to note it under Remarks on all certificates, whether for market receipts or shipments, excepting only those certificates issued for export trade. In addition to such a definite and prescribed policy for the certification of particularized information of importance in the market evaluation of grain, the present policy of permitting grain inspection departments by request to note regularly other facts of market significance, and of permitting individuals to obtain the certification of additional information by application to licensed inspectors, may well be continued.

Detailed Information About Smutty and Garlicky Wheat and Rye

The degree of smut and garlic in wheat and rye are factors of such importance in designating the utility values in these grains that it appears desirable to establish definite grades for Light Smutty, Smutty, Light Garlicky, Medium Garlicky, and Garlicky wheat and rye. Such grades, therefore, are recommended and described in the proposed standards for wheat and rye. They would take the place

of the present mandatory notations under Remarks with reference to the degree of garlic in wheat and the present optional notations with reference to the degree of smut in wheat.

Proposed Certification Regulations Governing Required Remarks on Certificates

In conjunction with the proposed standards, it is recommended that inspectors should be required, by regulations, to note regularly (subject to certain exceptions for export grain) in all certificates issued for both receipts and shipments (1) the factor or factors which determined the grade, except in the case of grade No. 1, to which may be added any other factor, or the complete analysis, in the same manner as required by existing regulations; (2) the test weight per bushel of corn, grain sorghums, and mixed grain, in addition to the test weight notations now required for wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley of classes I and II; (3) the mositure content of wheat and corn of all grades, of all grain sorghums graded lower than No. 2, and of all rye, oats, Feed Oats, Mixed Feed Oats, barley, and Mixed Grain graded Tough or Sample grade; (4) the kind and percentage quantity of unnatural material for all lots of wheat, rye, oats, barely, corn, and grain sorghums, graded under the provisions of the special grade Unnatural Material; and (5) in case of mixed grain, the percentage of total damaged kernels when in excess of 7 percent, the percentage of heat-damaged kernels when in excess of 0.5 percent, and the name of the class of wheat when the mixture consists of 75 percent or more of wheat.

The detailed specifications of these proposed regulations may be observed in the sections of this report entitled "Proposed Regulations for Certifying Statements under Remarks" which immediately follow the proposed standards for each kind of grain.

These proposed regulations would modify the existing policy pertaining to required notations under Remarks in grain certificates, with respect to the individual factor of test weight per bushel, and would add thereto required notations pertaining to moisture content, unnatural material in wheat, rye, oats, barley, corn, and grain sorghum and the individual factors of quality in Mixed Grain.

Proposed Notation of Test Weight Information

The existing policy with respect to test weight per bushel notations requires the test weight of wheat, rye, oats, Feed Oats, Mixed Feed Oats, and barley of all classes, to be noted under Remarks. The proposed policy would continue the use of these notations, except for Western Barley, and would require test weight notations also for corn, grain sorghums, and Mixed Grain. Although the test weight per bushel of corn and grain sorghums is not as important as a measure of utility value in these grains as it is in wheat, rye, and oats, it is of as much commercial significance as in barley, and there is a considerable popular opinion that the test weight per bushel of corn and grain sorghums is a significant measure of feed value. Undoubtedly it has considerable importance in the market evaluation of corn and grain sorghums, especially in the evaluation of those commercial lots which have high test weight per bushel but which are of low grade according to other grade factors. For these reasons it appears desirable to note

the test weight per bushel in certificates for corn and grain sorghums as well as in those for the other kinds of grain. Also, in case of the proposed new class Mixed Grain, notations of test weight are of importance because the proposed specifications for Mixed Grain do not include numerical grades in which test weight per bushel is a grade factor.

Proposed Notation of Moisture Content

The existing policy with respect to moisture-content notation for all kinds of grain is one that permits optional practices by the public grain inspection agencies or inspectors. Under this optional policy a few inspection departments make moisture tests on all kinds of grain and note the percentage of moisture regularly on all certificates, other inspection departments follow a similar policy for wheat and corn, while with some inspection departments the testing and certification of grain for moisture content is a seasonal procedure that is followed only when the hazard is great that grain of any kind may have a high moisture content.

The Bureau believes that the individual factor of moisture content is a factor of such outstanding importance in determining the grade of corn and grain sorghums, in indicating the dry-matter content of wheat and corn, and of such present-day importance in connection with the accurate determination of the protein content of wheat, that, for the benefit of the entire grain industry, a definite, uniform policy should be adopted of requiring all grain inspection departments, by regulation, to make moisture tests on all lots of wheat and corn and on all lots of grain sorghums graded lower than No. 2 on account of any grade factor, and to certificate the percentage of moisture under Remarks. Definite moisture content information on all certificates for wheat and corn, especially, should serve to standardize premiums and discounts according to this important measure of quality and condition as well as to bring out substantial premiums for low moisture content grain in some seasons and markets.

With further respect to the notation of moisture content information on certificates, the Bureau recommends that, in conjunction with the proposed special grade Tough in the standards for rye, oats, Feed Oats, Mixed Feed Oats, barley, and Mixed Grain, the percentage of moisture should be determined and noted on certificates for all grain of these kinds that is graded Tough or Sample grade. Required notations of moisture content are desirable and needed for grain of this character because any grain that would come under the specifications of the proposed special grade Tough would be included in a grade having a moisture content range of 1½ percent, within which range the utility values vary according to whether the grain, barley for example, has a moisture content of 14.6 percent, or 15 percent, or 16 percent. Thus, in the market evaluation of "tough" grain, moisture content notations should serve to graduate discounts, especially in sample floor trading.

The adoption of this definite national policy with respect to moisture testing and certification of moisture content on certificates, would increase the work of some of the public grain inspection departments, but the Bureau believes that definite information with respect to this measure of quality is of such great importance to the producers, handlers, and consumers of grain, as to warrant and justify the ex-

pense of obtaining and recording it. In all considerations of the problem of making moisture tests during the peak movements of market grain, or of the expense thereof, it should be kept in mind that electric moisture-testing equipment is likely to be adopted widely in the near future to lower the cost and to speed the work of determining moisture content.

Proposed Notation of Information About Unnatural Material

The proposed regulation that would require inspectors to note on certificates the kind and percentage quantity of unnatural material for all lots of wheat, rye, oats, barley, corn, and grain sorghums, graded under the provisions of the special grade Unnatural Material, is essential to provide complete information for use in the evaluation of such grain. When, for example, an occasional car lot of wheat is found to contain more than 0.3 percent of such unnatural material as corn or grain sorghums, or when an occasional car of corn is found to contain more than 0.5 percent of such unnatural material as oats, and the grade designation, therefore, includes the words "Unnatural Material", additional information is needed with respect to the kind and quantity of such material for the purposes of a proper market evaluation of the grain. In the absence of such information the grain trade would not know, except by estimation, whether a car lot of wheat graded No. 2 Hard Winter, Unnatural Material, for example, contained one half of 1 percent, 1 percent, or a greater quantity of unnatural material. The adoption of this regulation would add an almost negligible amount of work to the present inspection procedure because of the normally small percentage of the car lots of market grain which contain unnatural material.

Proposed Notation of Information about Mixed Grain

The proposed standards for Mixed Grain would grade mixtures of grain not otherwise provided for in the standards merely as Mixed Grains or Sample grade Mixed Grain, and a statement of the percentages of the various kinds of grain in the mixture, together with the percentage of foreign material, would be included in, and made a part of, the grade designation. Numerical grades for mixtures of this character are impractical because grade limitations for any given grade factor that would be suitable for one mixture of different grains would be unsuitable for other mixtures of other grains.

For these reasons, certificates for Mixed Grain should provide some detailed information under Remarks with respect to the important individual factors which indicate the utility value of these grain mixtures for manufacturing or feeding purposes. This matter is of special significance in consideration of the fact that mixtures of wheat and rye, wheat and barley, and wheat and oats, comprise the greater part of the market receipts of Mixed Grain.

The Bureau recommends, therefore, a certification policy for Mixed Grain that would require all inspection departments to note regularly under Remarks, in all certificates for Mixed Grain (subject to certain exceptions for export grain), a statement of (1) the test weight per bushel, (2) every factor which determines the grade for those lots which are graded Sample grade, (3) the percentage of moisture for every lot which is graded Tough or Sample grade account moisture,

(4) the percentage of total damaged kernels for those lots which contain more than 7 percent of damaged kernels, (5) the percentage of heat-damaged kernels for those lots which contain more than 0.5 percent of heat-damaged kernels, and (6) the name of the class of wheat, other than Mixed Wheat, when the mixture consists of 75 percent or more of wheat.

By these methods all certificates for Mixed Grain would show in the grade designation the kinds of grain, the approximate percentage of each kind in the mixture, and the percentage of foreign material, while under Remarks there would be noted the test weight per bushel, the moisture content when the grain contained excess moisture, the reasons for Sample grade when that grade was assigned, and the amount of damage when present in an amount greater than 7 percent. The sum of all such information should provide a clear picture of the quality of any given lot of Mixed Grain.

Need for Detailed Information about Grain Quality Within Grades

The chief objective in the notation of analytical information on certificates is to bring out and emphasize the superior values in grain, particularly in grain graded lower than No. 2, according to certain individual factors of quality, which values are often hidden in the grade designations of a grain-grading system wherein each numerical grade is founded on numerous factors of quality but in which the grade may be established from any single factor of quality that is lower in degree than the other factors.

This objective would be attained in part by the regulations recommended in conjunction with the proposed standards for the certification of important information that is supplementary to the grade designation. A definite policy of this character for the certification of supplementary information is desirable in our national grain inspection service because (1) grain grades founded on the principles of the present official standards often do not indicate and emphasize the relatively superior quality within any given grade of many lots of grain, especially country-run grain, (2) the proposed policy conforms to the practices now used in sample markets for evaluating the quality of grain according to certain important individual factors of quality as well as by grade, (3) the proposed policy would be equitable for all elements in the grain industry, and (4) the proposed policy would comprise the notation of as much analytical information as is feasible at the present time under the existing system of grain inspection in the United States.

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